▶ ANALYSIS

Whither Mac net?

BY PEGGY WATT
Special to Network World

Apple Computer, Inc.'s inclusion of a Small Computer Standard Interface with its Macintosh Plus is evidence that Apple's communications with the rest of the world is getting better.

Products announced with the new Macintosh included a network storage system from 3Com Corp., a bridge from Hayes Microcomputer Products, Inc., a server from Infosphere, Inc. and an alliance with Northern Telecom, Inc. to link the Macintosh with the Northern Telecom private branch exchange systems for voice and data transmission.

Apple President and CEO John Sculley said at the Macintosh Plus' introduction that the company's "one person, one computer" vision has widened to "One person, one computer — with freedom to connect, to become part of a larger system, to access a world of other computers." Sculley later said alliances for developing communications products are top on Apple's list of

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PROTOTYPE
sample issue
Published weekly starting March 24, 1986.

NETWORK WORLD
THE WEEKLY FOR LEADING USERS OF COMMUNICATIONS PRODUCTS & SERVICES JANUARY 27, 1986

▶ DEATH OF A NETWORK

AT&T gives up; Net 1000 axed

"AT&T underestimated the complexity of what it was trying to offer."

BY JOHN DIX
Senior Editor

After ten years, four name changes, an estimated investment of one billion dollars and multiple attempts at repositioning, AT&T Information Systems has pulled the plug on Net 1000, an intelligent network processing service.

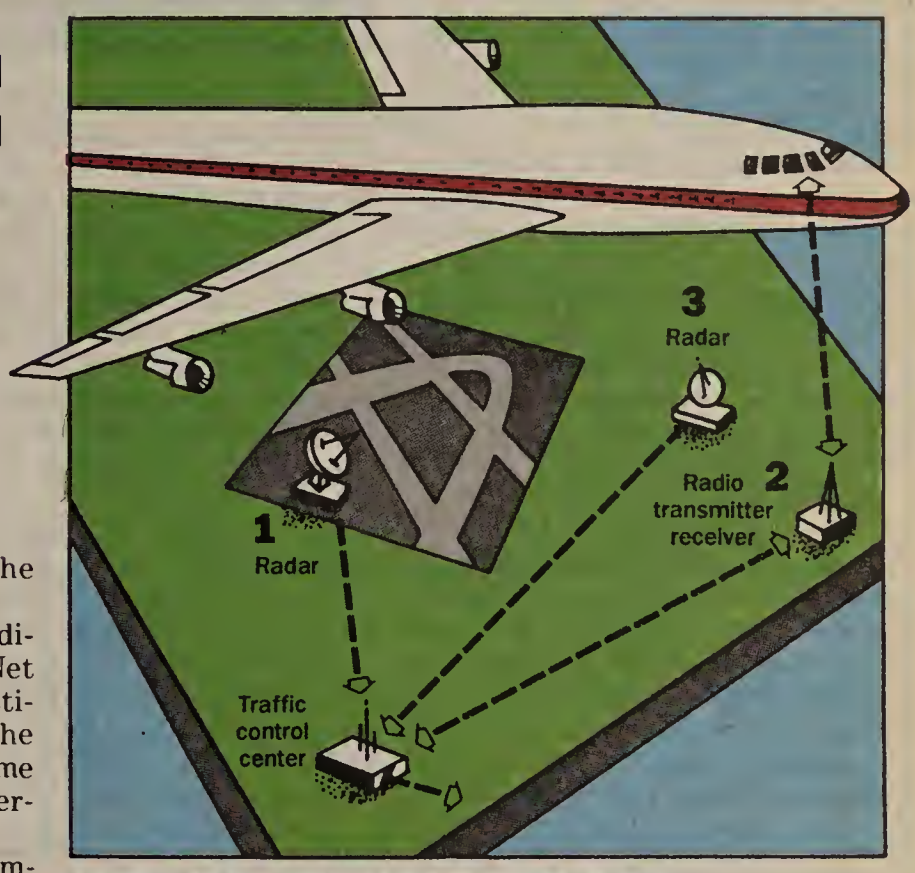
Once proposed as a service that would enable any type of terminal to communicate with any kind of host, Net 1000 was most recently reduced to a user programmable service that would facilitate communications between a company and its suppliers, customers or sales personnel. Even attempts to focus it on verticle markets, such as mortgage and automobile industries, failed to breathe lifeblood into the floundering service.

Although the company would not divulge the number of users affected by Net 1000's withdrawal, industry sources estimate there were roughly 20, about the same number — although not the same companies — that signed on to test the service when it debuted in January 1983.

"Net 1000 failed because the telecommunications world has changed since it was designed," said Mark Winther, a senior analyst with New York-based Link Resources Corp. "AT&T set it up as a powerful, intelligent network with the idea that customers could program it themselves to do the types of applications they needed.

Continued on **page 4**

▶ AIR TRAFFIC CONTROL EXPLAINER



**Airport radar (1) tracks plane during takeoff.
Remote radar (3) takes over en route.
Pilot communicates via VHF radio and telephone lines (2).**

Disaster deliverance

BY STEVE MOORE
Features Editor

After a succession of horrifying airline crashes worldwide killed more than 2,000 people during 1985, air transportation systems are under intense scrutiny.

Yet, relatively little attention is being paid to air/ground communications. Most inquiries focus on aircraft maintenance and repair or on human interaction during air traffic control. Passengers and pilots alike bet their lives on air/ground

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Network line

News

Communications managers in major metropolitan areas earn between $47,200 and $63,100, according to a recent survey. Page 15.

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In the first Network World **product review, the Digital Communications Associates' Netlink T-1 multiplexer line gets high marks. Page 19**

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Does ISDN answer every problem? There's a "Pro & Con" to that debate. Page 12.

Ford is lagging behind General Motors in the development of Manufacturing Automation Protocol factory systems. Page 23.

▼

AT&T Technologies reversed the tide of 1984, shipping more digital central office lines than Northern Telecom during 1985. Page 2.

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Features

An interview with TCA president Prince I. Dyess reveals a true user advocate. Page 26.

▼

Because Pepsico chose a software-defined network in Chicago, it doesn't have to worry about purchasing or managing tandem switches and dedicated circuits. Page 37.

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Product focus: 2,400 bit/sec modems are technological hits, but they're also sales duds. Page 43.

SCOOP:

Ungermann-Bass buys Soderblom patent rights.
See page 5

▶ CENTRAL OFFICE

AT&T first in CO

After trailing Northern Telecom in '84, AT&T Technologies moves back in front.

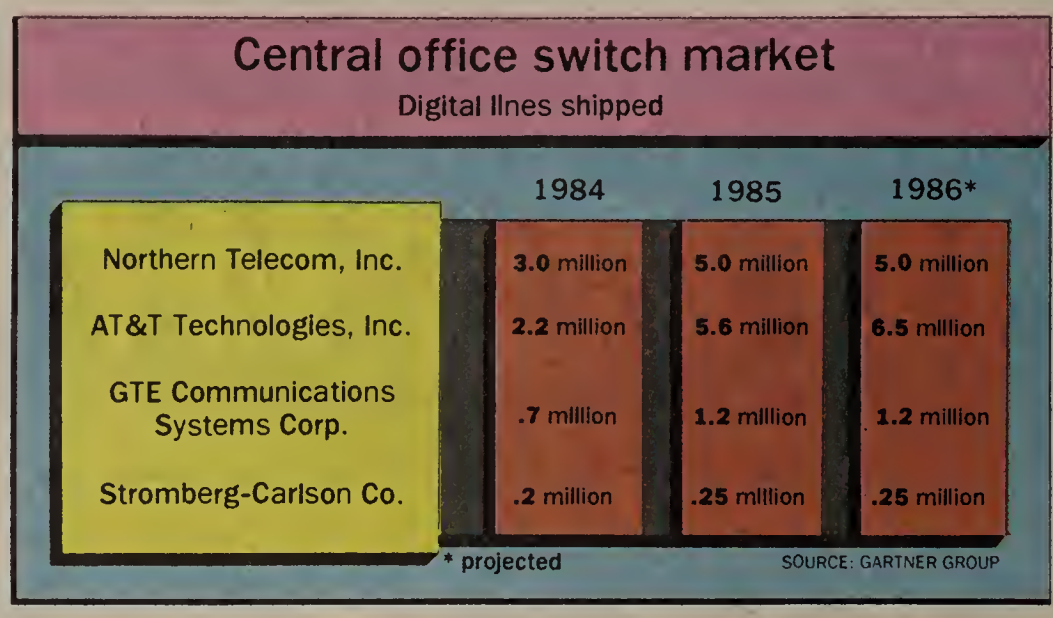
BY BOB WALLACE
Senior Writer

The central office switching year, in review, was a positive one for AT&T Technologies, Inc. After finishing second in 1984 to Northern Telecom, Inc., AT&T staged a major comeback with the success of its 5ESS digital central office switch.

Bill Walbert, research analyst with the strategies telecommunications service of the Stamford, Conn.-based Gartner Group, claimed AT&T edged past Northern Telecom last year, shipping a total of 5.6 million digital lines in the U.S., compared with Northern Telecom's 5 million. AT&T shipped 800,000 fewer lines than Northern Telecom in 1984.

Walbert said GTE Communications Systems Corp. is the third-largest central office switch supplier in the U.S., based on number of lines shipped in 1985. He added, however, several vendors are battling GTE Communications to become the third-largest central office switch provider to the regional Bell operating companies.

In addition to GTE Communications, those contenders include ITT Telecom Products Corp., Siemens Corp., NEC Telephones, Inc., Ericsson Information Systems, Inc. and Stromberg-Carlson Co. ITT Telecom is an unknown quantity in the U.S. central office switch market, although, according to Walbert, it is the second-largest provider of telecommunications equipment in the world. Still, the company has yet to firmly establish itself in the U.S. large central office switch market.



Siemens has made its presence felt in this market with its EWSD product. The switch producer has already sold EWSDs to Wisconsin Bell, which used the device as part of its traveling integrated services digital network demonstration late last August. Here's how Walbert evaluates the vendors:

■ GTE Communications: Several months of discussions between Siemens and GTE Communications have finally reached fruition. GTE Communications does have a viable entry in the Class 5 switch market with the GTD-5 EAX.

■ ITT Telecom: "In the U.S. switch market, it has done nothing. The question is, will it be able to sell the [System 12] 1240 in the U.S.?"

■ Siemens:"One of the major surprises in 1985 was how Siemens came from a dark-horse contender to the leading contender for the number three spot. "

■ Digital Switch Corp. (DSC): "No one even thought it could design and develop its Class 5 switch." DSC already has a Dex 5 up and running at Rochester Telephone Co. in Rochester, N.Y.

"DSC's biggest problem will be coming up with the basic capabilities the other Class 5 switches have. It will have a difficult time breaking into the RBOC market."

Stromberg-Carlson shipped 200,000 to 300,000 digital lines in the U.S. last year and has been pushing its DCO product line, while Ericsson, which has met with great success pitching its Axe 10 overseas, is marketing the switch as the brains of its cellular radio systems in the U.S. C.I.T.-Alcatel is offering its E10 Five switch.

AT&T's 5ESS grabbed countless headlines in the past year. The 5ESS will be the first switch of its kind to be used in a major ISDN field test when Illinois Bell and McDonald's Corp. begin ISDN service testing early this fall. Northern Telecom, GTE Communications and ITT Telecom switches will also be used in BOC-sponsored ISDN trials this year.

"The benefit of the 5ESS is that it will be the AT&T flagship product when ISDN arrives," Walbert explained. "Companies understand AT&T is going to deliver the 5E.4 generic software program in 1987."

The software program gives the 5ESS ISDN capabilities. "Companies are saying the 5ESS is going to get ISDN functionality sooner than anything else and that AT&T will support the 5ESS for the next 15 years. So I know I can't go wrong if I have one," he added.

The use of central office switches in corporate nets may help create a niche market for these switch vendors. Tymnet/McDonnell Douglas Network Systems, Inc., Wang Laboratories, Inc. and Electronic Data Systems Corp., a subsidiary of General Motors Corp., have already installed large central office-type switches.

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IBM ON TELECOMMUNICATIONS

Q. IF DATA NETWORK MANAGEMENT IS SO IMPORTANT, HOW COME PEOPLE DON'T AGREE ON WHAT IT IS?

A. One reason is that within the telecommunications industry there isn't much agreement on what is meant by the word "network." What one company calls a network, a second company considers to be only a small portion of what it calls a network. The differences are ones of scope and scale. And they are truly significant.

Q. Can you give me an example?

A. Some people might consider a data network to be a web of phone lines. But when manufacturers of modems (devices that enable computers and terminals to communicate over phone lines) talk about a network, they usually mean the phone lines *plus* the modems.

And when IBM talks about a data network, we mean something far more inclusive.

Q. What's IBM's definition of a network?

A. First, let's look at why data networks exist. A network's purpose is to enable a person at a terminal to communicate with a host computer and other users, and thereby produce useful work.

In IBM terms, a network includes the communications capability of the host computer, the individual terminal and everything in between—regardless of whether that terminal is located in the next room, in the next state or in the next continent. And regardless of whether it's one terminal—or one thousand terminals.

So when IBM says "network management," we mean the end-to-end management of your entire IBM data network.

Q. What's IBM's approach to network management?

A. We provide a system of hardware and software products that enables the network operator to "see" down the communication lines all the way to the end terminal. With this ability the operator can anticipate and correct potential network problems before they become real network problems.

And if there is a real network problem —an interruption or slowing of service— the operator can isolate and identify the specific component that is causing the problem and recommend the best way to fix it. You see, the purpose of network management is to ensure the consistent delivery of quality information to the network users.

Or, more simply stated, it's the ability to detect and correct problems rapidly, regardless of where they occur on the network.

Q. Why should I even worry about network problems?

A. For many companies, when their networks slow down, their ability to do business slows down. Network availability means that remote locations can enter customer orders, answer customer questions, check delivery schedules and just generally be productive. Your network's performance can materially affect your company's ability to compete in today's marketplace.

Q. How can I tell if my company's network is operating up to snuff?

A. One barometer is response time. That's how long it takes a terminal to answer a request. Now a lot of things can affect the network's response time. How busy is the host? How complicated is your request? What communications equipment are you using between the terminal and the host?

The point is, once the end user and the telecommunications manager agree on an acceptable response time, IBM network management products have the ability to monitor the actual response times and give an early warning of service deterioration.

Another barometer is how long it takes to get a problem fixed. We found that in networks that use our approach, the vast majority of problems are immediately fixed by the network control center during the initial phone call for help. Now, we'll be quick to add that when a tornado in Kansas tears out a lot of phone lines, that's a major problem. But most network problems aren't caused by tornados. They're caused by little things like a loose wall plug or the fact that someone forgot how to log on to the system.

Q. Is there a limit to how large a network the IBM products can manage?

A. Not really. We use our products to manage our own network of over 50,000 terminals and printers scattered all across the country. From one site we can determine the physical location and operating condition of every piece of equipment.

In addition, when your company adopts the IBM approach of end-to-end network management, you'll be able to tell from your network control center if the problem is a loose wall plug in San Francisco, a noisy line in Boston or a tornado in Kansas.

Q. Is this pie in the sky? Or are these products available now?

A. The IBM network management hardware and software are available now, and they're designed to grow with your company. In fact, this network management capability is already built into much of the IBM hardware you currently have.

Q. Why should I adopt IBM's approach to network management?

A. Because only IBM can offer you an end-to-end solution. Our hardware and software will enable your company to manage your data network from the host computer all the way to the very last IBM terminal.

Perhaps the best way to get an understanding of IBM's approach to network management is to visit an actual installation. If you'd like to do that, talk to your IBM marketing representative.

And if you would like to read more about IBM's approach to network management, send for the free brochure, "Building a network is an ongoing job." Use the coupon or call 1 800 IBM-2468, Ext. 90/LT.

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Net 1000 from **page 1**

"It was a good idea," Winther added, "but AT&T underestimated how much time a customer would want to spend doing the necessary programming. Why use a third party if you have to do all the work?"

With Net 1000, a company could, for example, establish a catalog within the network listing products for sale. Customers or sales representatives could access this data base from most any type of terminal and generate purchase orders in a standard format, which would later be dumped in batch mode to the seller's host computer.

While unique among available services, there was never an overwhelming need for such a service. After testing the service, many companies, among them Roadway Express, Inc. and Ford Motor Co., resorted to their own networks.

"AT&T underestimated the complexity of what it was trying to offer," said Victor Krueger, vice-president of telecommunications industry services with Dataquest, Inc., a research firm in San Jose, Calif. "It withdrew the service once to retrench, and when it was resurrected, it was less ambitious, but still very sophisticated."

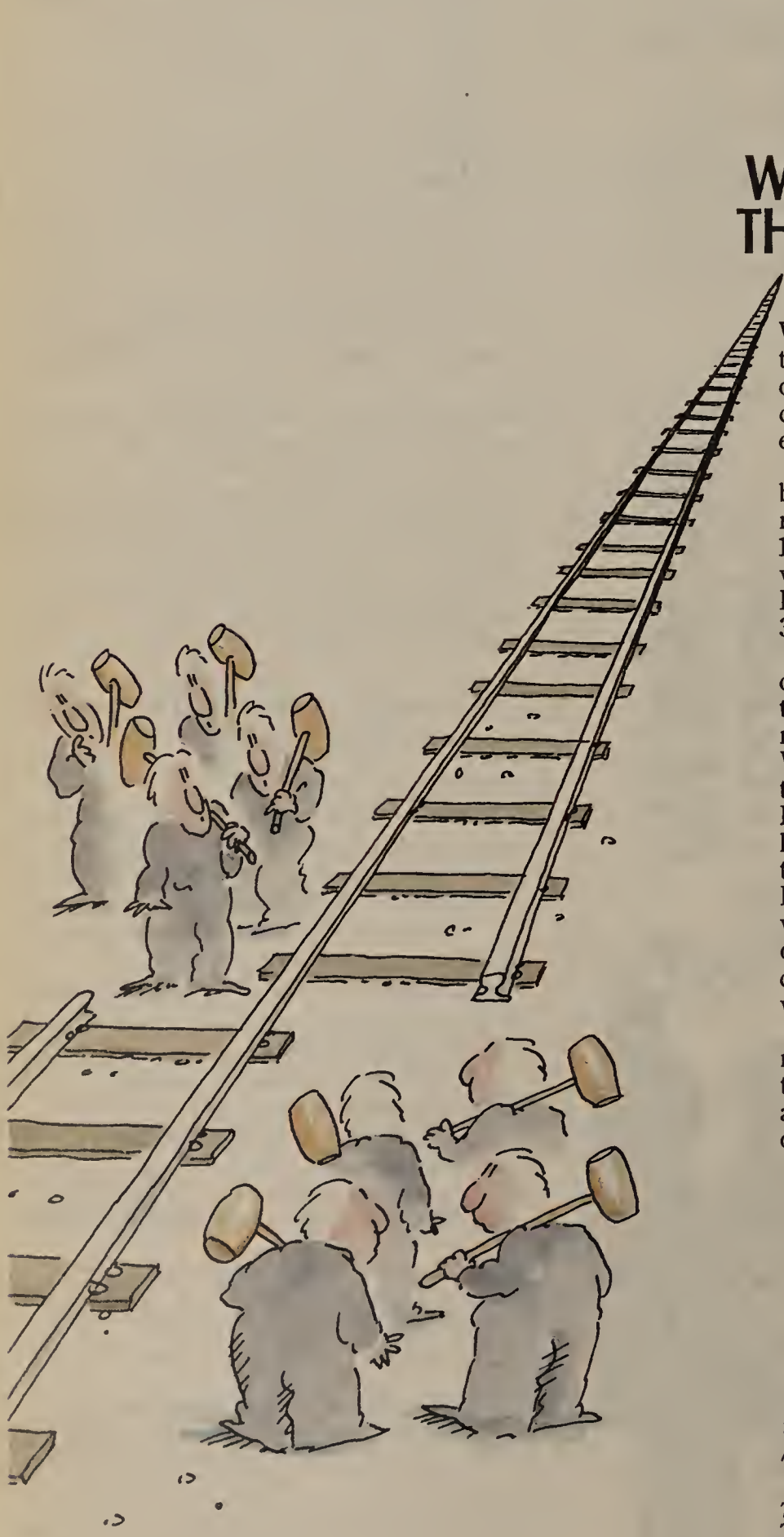
That stumble cost the company credibility. "AT&T lost marketing momentum," Krueger said.

For its part, AT&T attributes Net 1000's failure to the tremendous growth of personal computers and minicomputers. "A lot of the intelligence we built into the network ended up on the user's desktop," an AT&T spokesman said.

Others blame poor marketing. One anonymous user said, "There is a need for a service to convert the variety of message and protocol formats out there into one standard, a service AT&T was capable of offering. It was more of a marketing problem than technical."

Net 1000 was born as the Bell Data Network in 1976, came public in 1978 as the Advanced Communications System and was renamed Advanced Information Systems/Net One in 1982. Later that year, it was changed to Net 1000 when AT&T found out Ungermann-Bass, Inc. had a network named Net 1.

When asked how AT&T could name a service Net 1 when Ungermann-Bass already had its own Net 1, a company executive said, "What's an Ungermann-Bass?"



WHEN IT COMES TO BUILDING WIDE-AREA NETWORKS, THERE'S NO SUBSTITUTE FOR EXPERIENCE.

While any number of companies can offer to sell you a private wide-area network, one company can offer you 25 years of computer and communications experience along with it. BBN Communications.

Experience that includes designing and building the world's first packet-switching network for the U.S. government back in 1969. Since then, it has evolved into the world's largest wide-area network, the Defense Data Network, connecting over 30,000 users throughout the world.

But the U.S. Government isn't the only customer with tough networking problems that BBN has helped to solve. Numerous major corporations, among them Wang, Weyerhaeuser, and MasterCard, not to mention European giants like England's National Westminster Bank and Italy's largest corporation, ENI, have also found the answers they were looking for from us. Each came to BBN with a unique networking problem—from integrated voice/data transmission to electronic mail to credit authorization—and each came away with a unique networking solution.

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INDUSTRY UPDATE

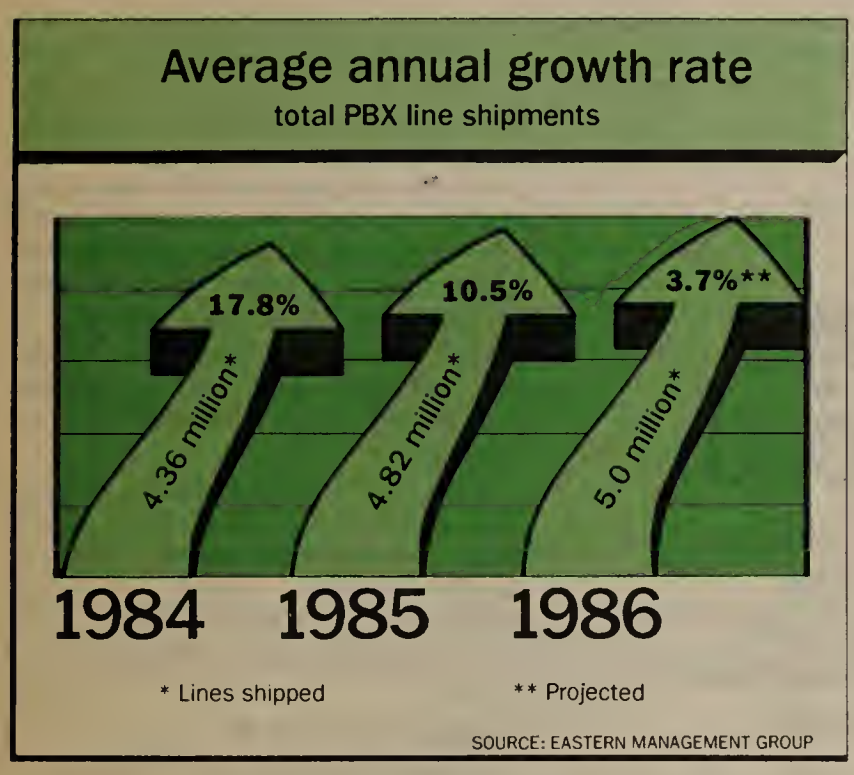
Scrapping the scrap

Two hundred and seventy-five employees of the Overland Park, Kan.-based Ericsson Telcom Cable Division of Ericsson, Inc. were paid cash bonuses totalling $38,000, as a reward for reducing the amount of scrap produced in the cable manufacturing process. The bonus program is the brainchild of George Benjamin, vice-president and general manager of Ericsson, Inc.

▶ PBX STUDY

Shakeout ahead

Total lines shipped will increase 3.7% this year.



BY BOB WALLACE
Senior Writer

The nation's private branch exchange vendors and distributors are facing a slow year ahead, punctuated by a market shakeout, according to a soon-to-be-released report by the Eastern Management Group. Entitled "PBX: The New Environment," it predicts that total PBX lines shipped annually will increase a mere 3.7% this year.

"As PBX prices per line continue to plummet, industry revenue will most likely move from $3.615 billion in 1985, to $4.25 billion in 1990," the report claims. "Industry revenue in 1986 should be essentially flat." Total revenue is projected to drop to $3.6 billion.

Charles Carroll, research vice-president for the

Continued on **page 6**

▶ TOKEN-RING NEWS

UB pays Soderblom for patent

BY BOB WALLACE
Senior Writer

In a dramatic move that signals far-reaching effects on local-area network vendors, Ungermann-Bass, Inc. has signed a license agreement for the worldwide patent rights to the token-ring technology developed by Olof Soderblom, vice-chairman of Willemijn Houdstermaatschappij BV, in Rotterdam, the Netherlands.

The signing came after Ungermann-Bass's legal department, general counsel and a patent attorney hired by the company reviewed the patent for several months. Terms of the agreement were not announced.

Continued on **page 6**

CONTRACTS

Chongqing, China — **NovAtel Communications Ltd.** has been selected to supply the first public cellular telephone system for the City of Chongqing, China.

Milpitas, Calif. — **Racal-Vadic, Inc.** announced that it has been chosen to supply Transaction Terminals for the **United States Shoe Corp.**

Nashville — **Northern Telecom, Inc.** announced it was awarded a seven-year supply agreement to provide **Nippon Telegraph & Telephone Public Corp.** with digital switching systems for the Japanese public telephone network.

Overland Park, Kan. — **Ericsson Lightwave** announced an agreement with **US Telecom, Inc.** to supply fiber-optic cable for portions of the intercity route of US Telecom's long-distance fiber-optic communications network during 1986.

Orem, Utah — **Novell, Inc.,** a computer networking and data communications company, announced the signing of an agreement with **Corvus Systems, Inc.** under which Corvus Systems will be an OEM to Novell. Corvus Systems will manufacture Advanced Netware/O, a Novell operating systems software designed to run on Corvus Systems' Omninet and bundle it with their Omninet network card. The product will be available in the fourth quarter of 1985.

VENDOR VIEW

BY EUGENE B. LOTOCHINSKI

Responding to a quiet metamorphosis

Someone once said that the present always seems like a time of change, and that stability only exists in retrospect — an appropriate adage for a column that addresses issues affecting telecommunications vendors.

Although vendors always try to forecast and plan, they more often have to react to massive changes, such as the breakup of the Bell System, flourishing competition and phenomenal advances in technology. These are the kinds of changes that have forced vendors to respond quickly. But less clamorous alterations also deserve the vendor's attention.

One such quiet metamorphosis comes to mind: the changing nature of the customer's organizational structure and the relative places held there by MIS managers and telecommunications managers. Because information management increasingly is regarded as a strategic resource that can have a significant impact on the bottom line, the management of information — both telecommunications and DP — is now often combined into a single group function in the user's organization, usually headed up by people with an MIS background.

As a result, telecommunications vendors are dealing with people who occupy more senior levels and are called upon regularly to make buying decisions that can affect the organization's success for 20 years or more. Such people are technically more demanding.

This change is not unexpected. And it is not a change that the vendor community has ignored, but perhaps one that hasn't been responded to as quickly — or as carefully — as more dramatic occurrences in the marketplace. When coupled with other issues affecting the industry, the changing nature of the customer requires careful analysis and understanding.

Closing the sale now requires much more than visits by salesmen. Telecommunications vendors are finding that marketing, selling and maintaining account relationships must in every way match the leading edge characteristics of the product portfolio. Instead of just promoting hardware and features, the vendor must differentiate itself at the level of functional support.

Gone are the days when members of the telecommunications sales force just made proposals in response to requests for proposals and take orders. Today, they must be truly close to their customers. The new reporting line of telecommunications through MIS in the user's organization requires salesmen who are technically more knowledgeable about networking and office applications. It requires salesmen who understand both data and voice and know the competition.

It requires salesmen who understand many different kinds of DP and office automation equipment.

There is also the need for a multiplicity of relationships with the customer. Suppliers must understand how to deal with more senior levels in user organizations, and the vendor's senior management must become more involved in marketing and selling.

As the business of information management changes, so do the businesses that provide products and services for the management of information. A careful analysis of the customer and of where the responsibility for telecommunications sits within his organization is critical for telecommunications vendors to serve effectively the needs of the marketplace.

PBX from **page 5**

Parsippany, N.J.-based research firm, said the decrease in PBX vendors that began with United Technologies Corp.'s withdrawal from the marketplace in 1985 will continue this year.

"If vendors are not growing fast enough to keep up with the market, they won't be generating enough revenue for R&D," he explained. "That in turn causes vendors' products to become obsolete faster." Carroll maintained only AT&T and Northern Telecom, Inc. grew faster than the market in 1985.

The study also predicts a shakeout among PBX distributors, citing "razor-thin profit margins" and "an increasingly competitive environment" as factors spurring an industry upheaval. Carroll added users are becoming increasingly concerned about dealing with distributors when buying PBXs. "For major distributors, this won't be an issue," he said. "It's the fringe players that face this problem."

Competition in the marketplace is giving users the opportunity to shop for the best PBX value as well as the ability to pit vendors against each other on the issue of price. "Fierce market competition always accelerates the incorporation of new features and technologies into vendors' products lines," he added.

Increased competition among PBX vendors may also create problems for corporations planning a PBX purchase. The user will have a more difficult time deciding on a vendor. Carroll suggested users be particularly careful to choose a PBX vendor that will still be around in several years.

Users should also beware of many vendors' efforts to shift much of the post-PBX installation, maintenance and reconfiguration work to the user. "End users will be doing more work with PBX wiring and software changes," he declared. If vendors are successful in transferring some of this work load to their users, users might be faced with the need to hire additional personnel to maintain the switch.

The report also notes that the lion's share of the PBX user community has no immediate need for advanced third- and fourth-generation features such as a distributed PBX architecture, nonblocking transmission, data-switching capabilities and T-1 carrier interfaces. It firmly states: "Today, more than 90% of all PBXs have no requirements for the capabilities built into third- and fourth-generation switches."

Carroll defended this claim, saying, "Users are buying these capabilities because they want their equipment to be state-of-the-art. Progressive thinkers are depreciating the switches over five-year periods. That's a long time in this industry. Users want to have these capabilities so that if they aren't going to use them today, they can have them for the future."

The research vice-president predicted that 1986 would see Centrex services make a major comeback. "There are indications that BOCs have stemmed the tide of Centrex's demise," he asserted. BOCs are considering adding capabilities to Centrex services that would allow them to compete more evenly with PBXs loaded with third- and fourth-generation features, he said. Integrated services digital networks should be expected to play a major role in the resurgence of Centrex, as many BOCs will be looking to offer ISDN services over Centrex facilities.

Carroll listed the benefits of Centrex services: the availability of 24-hour, seven-day-a-week maintenance, system supply by the telephone company and the need for a lesser capital investment.

Now, One Of The Best Ways To Cut Overhead Is Overhead.

How a StarCom Satellite Communications Network lowers the cost of data transmission.

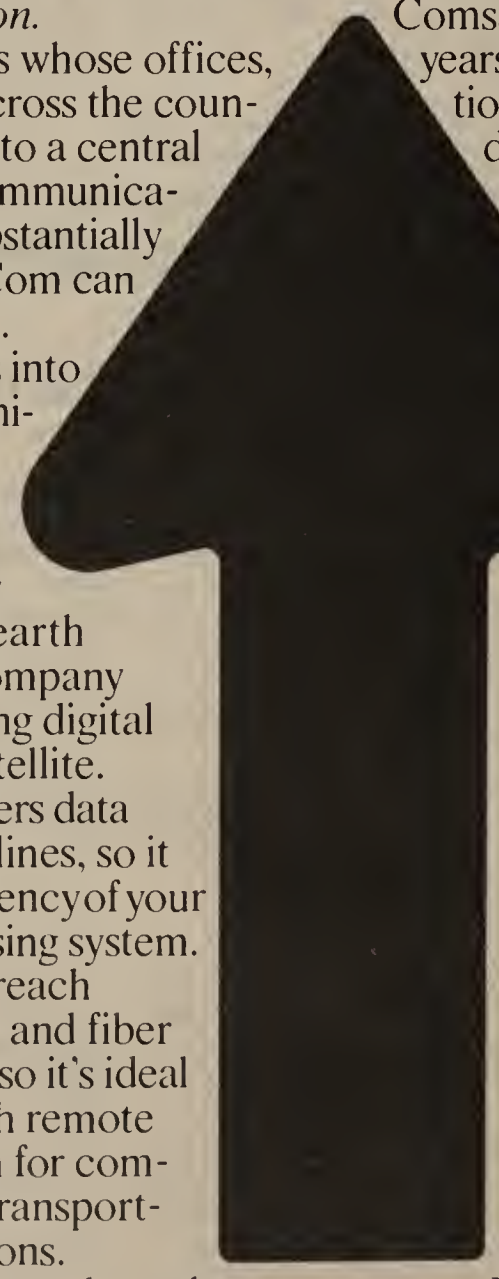
For companies whose offices, stores, or plants across the country are connected to a central computer, data communications costs add substantially to overhead. StarCom can reduce these costs.

StarCom plugs into your data communications system in place of leased phone lines and modems, with very small, intelligent earth stations at each company location exchanging digital information via satellite.

StarCom delivers data faster than phone lines, so it improves the efficiency of your entire data processing system.

StarCom can reach places phone lines and fiber optic cables can't, so it's ideal for companies with remote locations and even for companies who need transportable communications.

A StarCom network can be virtually any size, so it can expand as your company grows. It can even be augmented with additional capabilities, including voice transmission, when required.



StarCom is powered by communications software perfected by Comsat and proven for over eight years. No other satellite communications network can claim such dependability.

StarCom's hardware, also developed by Comsat, is backed by 22 years' experience with satellite technology. Combined with RF technology contributed by Mitsubishi Electric Corporation, this means the StarCom network is extremely reliable.

But most important, whether you buy or lease your network, StarCom gives you control over the cost of data communications. The result is that you realize dramatic savings over the cost of leased phone lines.

For many companies, StarCom is the only solution for bringing communications costs down to earth. To discuss the ways StarCom can work for your company, see us at Booth 936. Network Products Division, 22300 Comsat Dr. Clarksburg, Md. 20871, (301) 428-5000.

COMSAT TECHNOLOGY PRODUCTS

Booth 936

UB pays from **page 5**

Soderblom has long claimed to hold a valid patent covering token-ring technology. IBM validated that claim by paying a rumored $5 million as the first major networking vendor to reach agreement with Soderblom. Big Blue acquired a non-exclusive license to Soderblom's patent on transmission methods, including the token-passing ring scheme, in July 1980.

Since that time, industry analysts have speculated as to how other vendors planning to market token-ring technology-based products will address the pesky patent issue. Vendors might now follow the example of Ungermann-Bass.

Craig Tisdale, director of OEM sales for Ungermann-Bass, said at press time that the document was sent overseas to be signed by Soderblom. The vendor has already announced its intent to market a variety of token-ring-related products.

"In light of our investigation of patents for this technology, we felt the most responsible position was to obtain the license to protect ourselves and our customers from any potential risk of patent infringement," Tisdale explained. "We looked at it, but we are not going to say it's a valid patent," he added.

Bridget McNeil, token-ring product manager for 3Com Corp., of Mountain View, Calif., plans to market token-ring hardware and is investigating the patent issue.

Asked if the patent question would serve to retard the growth of the token-ring product market, McNeil said, "We could end up paying a royalty, which just increases the cost of token-ring products. If the technology becomes more expensive, then the market won't grow as fast."

TELECOM TRENDS

AT&T interstate tariff rates

Mileage	Old Initial	Old Additional	New (effective: 6/1/85) Initial	New Additional
1 - 10	$.38	$.19	$.36	$.18
11 - 22	.46	.25	.43	.24
23 - 55	.51	.30	.48	.28
56 - 124	.54	.35	.51	.33
125 - 292	.54	.37	.51	.35
293 - 430	.55	.39	.52	.37
431 - 925	.58	.40	.55	.38
926 - 1910	.60	.41	.56	.39
1911 - 3000	.69	.46	.65	.42
3001 - 4250	.71	.48	.67	.45
4251 - 5750	.74	.50	.70	.47

SOURCE: COM DEV, INC., SARASOTA, FLA.

▶ STANDARDS CLEARINGHOUSE

Testing for OSI compliance

Just look for that COS name on the mux.

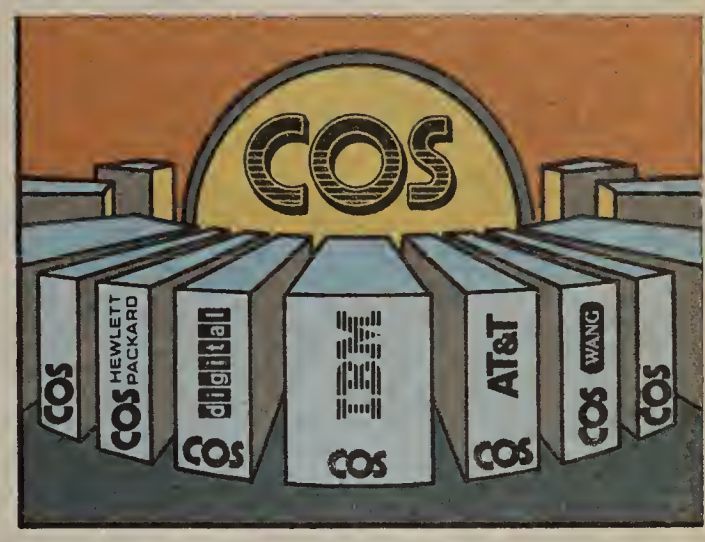
BY STEVE MOORE
Features Editor

Plans are afoot that may enable you to choose compatible computer and telecommunications products by simply watching for the Corporation for Open Systems (COS) name on the box, much as you look for the Underwriter's Laboratories, Inc. sticker on a household appliance. But don't hold your breath.

So far, 18 computer and telecommunications companies have agreed to contribute to COS, which was conceived nearly a year ago by the Computer and Communications Industry Association and may begin functioning this spring. The nonprofit corporation's purpose will be to test and certify products for compliance with specific standards of the International Standards Organization's Open Systems Interconnect (OSI) model.

> *"One organization providing conformance testing is ITI."*

Continued on **page 10**



CROSS TALK
BY JOHN DIX

Look before you leap in the long-haul market

Throw tariffs to the wind. Toss rates in the hopper. Procuring long-distance communications services to optimize networks for cost is beginning to require more shrewd negotiating skill than detailed analysis.

Competition for market share in the long-haul business is breeding some strange deals, such as discounted rates, free microwave access to a carrier's point of presence and agreement on the part of the former Bell operating companies to provide special facilities rather than lose business to bypass.

The crafty communications manager can parlay experiences used buying his last car into corporate savings. Dismissing sales offers makes the seller more aggressive.

Consider the carriers' position. The need to capture clients is akin to the economic parable of the razor and the blade. Carriers can afford to discount rates and give away access just as vendors can afford to give away razors. As with the razor deal, once the business relationship is established, the monthly business will make up the capture cost.

So eager are carriers, however, that promises may often exceed capabilities. Besides doing the usual exploration of a company's viability before entering a business deal, communications managers would do well to research the service offered.

Don't even take well-established carriers at face value. Users that report satisfaction with AT&T's long-haul competitors more often than not have taken the time to see if the carrier really services a given area, or if it is an area to which it is new or one it plans to serve soon.

The acid test, however, is customer satisfaction. Contact service users in the area to inquire about quality. Users groups are usually a good forum for this kind of discourse.

The industry is still churning. Carriers are jockeying for position and aligning partners, and the ailing among them are seeking white knights.

Perhaps the wierdest deals may come from the two monoliths, AT&T and the troika of IBM/Rolm Corp./MCI Communications Corp. It is something to watch for this year. These two companies have the resources to offer bundled packages that combine computing and communications hardware with long-haul services. While users would probably be wary of any such deal, the price will be something else to play with, something else to use in negotiations with other carriers.

▶ SERVICES

GTE service permits dial-up access to Telenet

X.25 Dial complies with CCITT X.32 recommendation.

GTE Telenet Communications Corp. extols its recently debuted service as the first synchronous, dial-up public data network service for personal computer or terminal users.

X.25 Dial provides end-to-end error detection and correction, transmission speeds up to 4.8K bit/sec and the ability to maintain up to 35 simultaneous host calls through a single network connection, according to Harvey Baumel, director of product marketing.

Previously, GTE Telenet has only supported synchronous terminal communications for certain protocols, such as IBM 3780 and, in limited cases, IBM 3270, and speeds up to 2.4K bit/sec.

X.25 Dial is said to comply with the CCITT's X.32 recommendation. "X.32 is the same logic as X.25, but is specified for use with dial-up lines instead of leased lines and with added provision for the identification of the end user," Baumel explained.

GTE Telenet expects 99% of the service's users to be personal computer users. To access the service, they will require a synchronous communications board for their micro that can run X.25 software and an Anderson Jacobson, Inc. AJ 4048, which is a 4.8K bit/sec modem that uses a proprietary protocol. Eventually, the carrier will migrate to use of CCITT's recommended V.35 modem standard at this speed.

The ability to access different CPUs over a single X.25 network link is limited by the single tasking nature of personal computers, but Baumel said some micro implementations of X.25 allow rotation.

This would enable a user to maintain simultaneous connections to an airline guide data base, GTE Telenet Telemail and Dow Jones & Company, Inc.'s Dow Jones News Service, Baumel explained. A function key could be used to toggle back and forth between virtual calls.

Baumel would not comment on how provision of X.25 Dial service would mesh with services offered by Uninet, Inc., something that will have to be ironed out should the proposed merger of GTE Sprint Communications Corp. and United Telecom Communications, Inc. go through as planned.

Plans call for the service to be available in 100 cities by the end of the year. In the interim, X.25 Dial access is available nationwide via an 800-number.

Baumel estimates X.25 Dial costs $6 to $7 per hour, as opposed to direct distance dialing charges, which range in price from $18 to $24 per hour.

GTE Telenet Communications Corp., 12490 Sunrise Valley Drive, Reston, Va. 22096.

FUTURE

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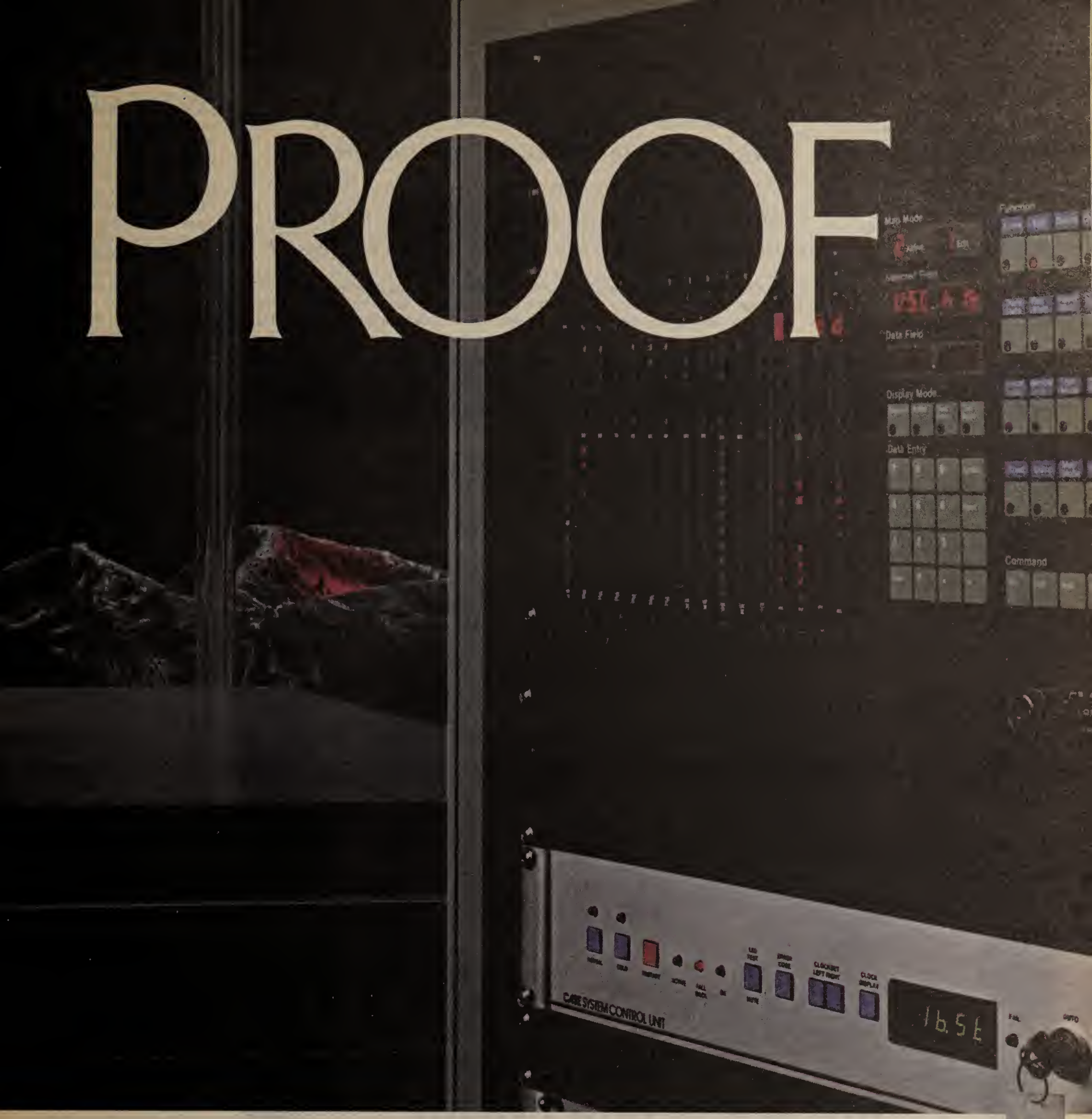
PROOF



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CASE

OSI compliance from **page 7**

Some telecommunications companies that will participate include AT&T, Northern Telecom, Inc. and Bell Communications Research, Inc. IBM, the only major computer maker not already a member, has been asked to join, but has not indicated whether it will do so. Although the founding members argue otherwise, IBM's stamp of approval, though unlikely, would virtually guarantee the organization's success.

"IBM has been asked to join, but has not indicated whether it will do so. Although the founding members argue otherwise, IBM's stamp of approval, though unlikely, would virtually guarantee the organization's success."

The presence of Bell Communications Research in this alliance of equipment vendors raises interesting questions.

Are the Bell operating companies so confident that they will be allowed to enter the equipment manufacturing business that they want their research arm to join all the right clubs now?

Or is Bell Communications Research merely fulfilling its mandate to keep its seven owners abreast of the latest developments in the standards world?

The responsibility for actually making equipment compatible still rests with the vendors, who have talked informally about open systems for years, but have been slow to put their money where their mouths are.

Bringing vendors to agreement about certification at the lower layers of OSI will be relatively easy. But certification of products at the application layer, particularly those that depend on document and message handling schemes, will have to wait until vendors quit haggling over the standards upon which certification will be based.

According to John W. Neumann, vice-president and technical director of Omnicom, Inc. of Vienna, Va., COS may be duplicating efforts already underway in other quarters. "There already is a voluntary ongoing effort on the part of all these vendors to participate in the work that's being done with the National Bureau of Standards," he said.

Robert Blanc, director of the NBS Center for Computer Systems Engineering, took a different view.

"The scope of the required effort has grown much larger than our program will ever grow, and we're certainly interested in getting all the assistance we can on a worldwide basis," he said.

"I think both efforts together will still have great difficulty attacking this really large problem," Blanc added.

"From our point of view, there is a need for a standard set of tests, hopefully international in scope, but in terms of how they are used, we don't get into that."

Blanc added that NBS has provided information about its programs to the organizers of COS.

Eager users are already fueling a strong new market in standards-oriented educational and testing services.

One organization that is already providing standards conformance testing is the Industrial Technology Institute, which is testing products for compliance with General Motors Corp.'s MAP (see column on Page 23).

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BOC BRIEFS

The University of Illinois has joined the institutions of higher learning that have cut purchase orders for multicampus communications systems. The school signed a $30-million dollar agreement with **Illinois Bell** that will provide the university with four large private branch exchanges, a fiber-optic backbone network and an integrated voice/data service that Illinois Bell spokesman Bill Ford described as "digital Centrex."

The Bell operating company and its wholly owned subsidiary, **Illinois Bell Communications,** are working to install the system that Ford said will be capable of handling more than 30,000 users when it becomes operational in March 1987.

The university will receive four Northern Telecom, Inc. SL-1 PBXs, to be located at off-campus sites. Illinois Bell will install the fiber network that will connect many university buildings, including dormitories. Illinois Bell will also work to improve the lightwave link between the university's Chicago and Champaign campuses.

Indiana Bell is currently conducting a packet-switching trial with **MCI Telecommunications Corp.** designed to show whether or not both companies' packet switches can work together. The BOC is attempting to pass traffic from its packet switch in Indianapolis onto MCI's packet network.

Indiana Bell is also working with **Electrotel** of Ballinger, Texas, to find a way to convert electromechanical central office switches so they can offer telecommunications services to rural areas at lower costs.

Electrotel is converting a central office serving Amboy, Ind., and Coverse, Ind. An Indiana Bell spokesman explained the regular conversion process costs roughly $500,000. The new process is designed to slash that figure to $150,000.

Ameritech recently released its capital spending program, which calls for the regional Bell operating company to spend almost $2 billion on maintaining current facilities and installing new transmission media and equipment this year. That's almost $5 million per working day.

Nynex Business Information Systems Co. has begun construction of a $4.6-million custom network for Digital Equiment Corp. of Maynard, Mass. The project requires the installation of roughly 80 miles of fiber-optic cable. A portion of the lightwave cable will be hung on phone poles; the remainder will be buried in the ground.

The completion of the construction phase of the project is expected before year end. Once operational, the network will provide 21 DEC locations in Massachusetts and New Hampshire with high-speed voice and data communications.

PRODUCTS & SERVICES

Photophone, Step Ahead Program introduced

Image Data Corp. announced a videotelephone for simultaneous voice and picture communications over dial-up telephone lines.

The **Photophone** is designed for companies that require voice and picture communications, but find live-action video conferencing units too expensive. The product connects to a single analog phone line.

Each Photophone costs $8,500. A pair of Photophones can be leased from a dealer for about $450 a month.

Image Data Corp., 7986 Mainland Drive, San Antonio, Texas 78250.

Equatorial Communications Co. announced a program designed to help data base and information providers and value-added remarketers create low-cost information products for point-to-multipoint distribution.

The **Step Ahead Program** reportedly allows qualified participants to receive private satellite data networks for product development and testing. The term of the program is 60 days.

The Step Ahead Program includes a 24-inch C-100 micro earth station.

Also included are transmission capacity up to 1,200 bit/sec on Equatorial satellite transponders and 24-hour, seven-day network operation.

Equatorial Communications Co., 189 N. Bernado Ave., Mountain View, Calif. 94043.

WITH OUR BRAND NEW MUX, YOU CAN KEEP USING THE SAME OLD LINE.

That makes it easier to own a mux. And a lot less expensive.

Because when you connect our 7400 Series statistical multiplexer to an ordinary phone line, you pay only for the calls you make. Not for the use of a leased line, 24 hours a day.

Obviously, this is no ordinary mux. For starters, it can handle 4 or 8 channels. And features (among other things) remote configuration and remote diagnostics. How remote?

You or your service people can examine and reset the 7400 from anywhere you can find a phone. And that's something no other multiplexer can offer.

Of course, the 7400 sends data over leased lines, too. Just like any other multiplexer.

But the way we look at it, why pay for a leased line if you don't really need one? What you do need is a brochure and that's free.

For yours, call (800) 543-3000, Operator 507. In California, call (408) 946-2227.

But don't stay on the line too long. One of our muxes might be trying to get through. ©1985, Racal-Vadic.

Racal-Vadic

Is there any reason to

PRO:

BY JAY KRAKORA
Contributor

At a time when the communications environment is highly volatile, the advent of integrated services digital networks is being hailed as a unifying force amid a cacophony of chaos.

The "pro" ISDN argument:

When it comes to telecommunications equipment, services and prices, today's telecommunications customer wants two things: choices and control. That's why competing equipment and service suppliers around the world have united to support the development of an ISDN.

Business customers today look at the purchase of telecommunications products in a different way than they did before divestiture.

They are actively exploring their options. In Chicago, for example, more than two-thirds of Illinois Bell's largest business customers have issued requests for information and requests for purchase to competing vendors since divestiture was first announced in 1983.

Most of Illinois Bell's large business customers are asking for an integrated voice/data system. The same is true for more than half of all other business customers served by Illinois Bell.

Even small businesses are buying personal computers and minicomputers to improve the productivity of their businesses. This ground swell in data communications needs is not limited to business. Growing numbers of people who use computer terminals at work also want them in their homes.

That is why Illinois Bell decided earlier this year to take the leading step in its digital deployment program by becoming the first U.S. company to announce it would offer ISDN.

ISDN is not a service. Rather, it is an invisible rebuilding of the local and long-distance telephone network to allow simultaneous digital voice and data transmission at high speeds over a standard pair of telephone wires.

The first commercial customer for the service is McDonald's Corp. of Oak Brook, Ill. Illinois Bell's ISDN trial with McDonald's will begin in late 1986 — the first offering in the country to meet international ISDN standards in customer service with full network functionality. Illinois Bell expects to be able to make the service available to other business customers in 1987.

Of course, there are alternatives to ISDN available today to businesses looking for integrated voice/data systems. These are private networks, purchased from a single supplier and maintained by the business' in-house telecommunications staff.

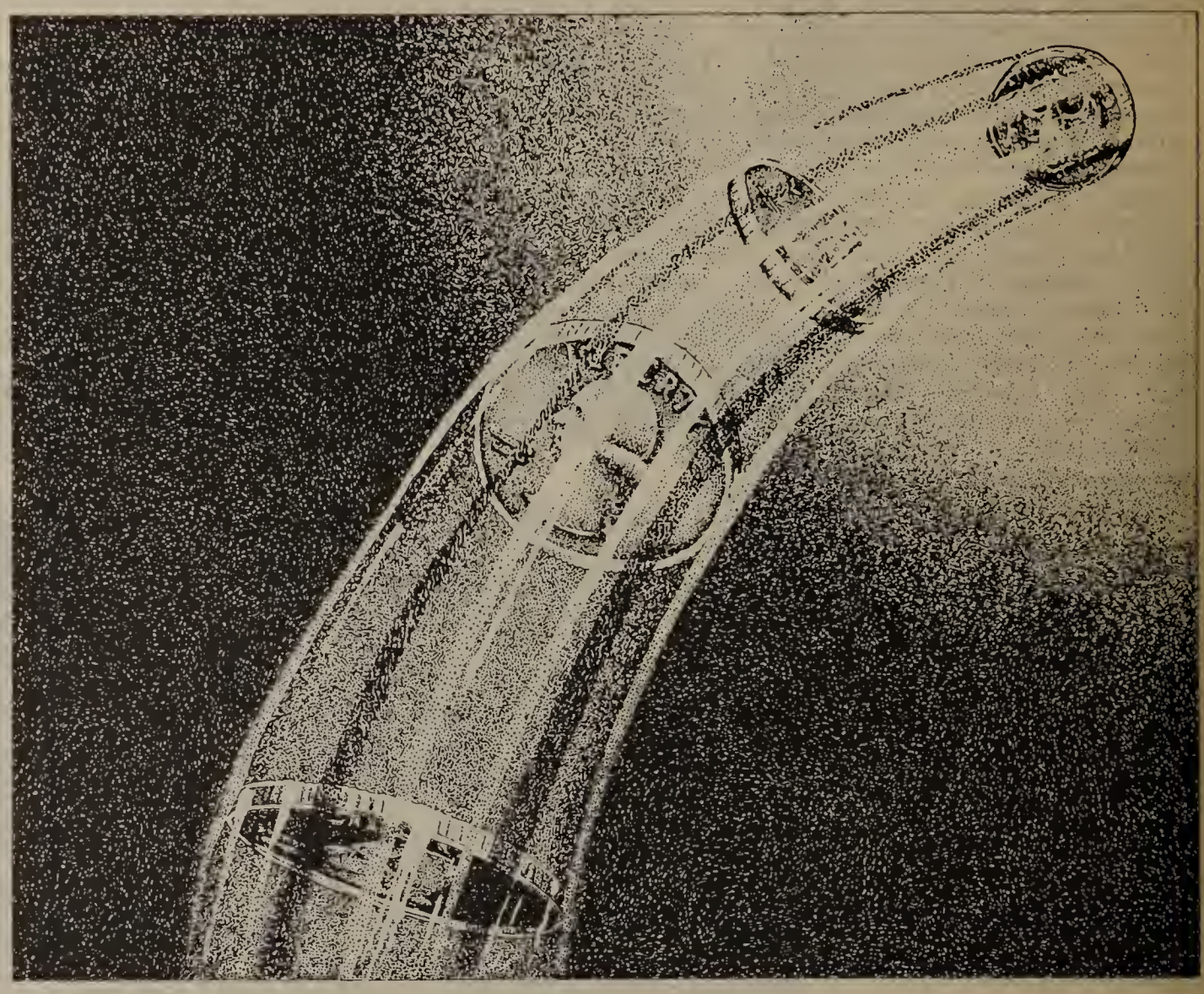
ISDN offers distinct advantages over these private networks:

- Businesses can choose equipment from a host of vendors. ISDN will be a standard network internationally. That means having an option when it comes to choosing telecommunications equipment to connect to ISDN.

  There is no need to lock into a single supplier, since ISDN standards will be open to all equipment vendors.
- International standards mean equipment manufacturers can produce ISDN terminals at economies of scale not possible for suppliers of

Continued on **page 14**

Krakora is a district manager at Illinois Bell, responsible for Network Architecture Planning. He also serves on the T1D1 national ISDN standard-setting committee.



BRUCE HOARD
EDITOR

Welcome to *Network World*

Welcome to the prototype issue of *Network World,* the newspaper for communications users.

What you see in this issue is very similar to what you'll be seeing every week starting March 24.

One area that will change between now and then is the masthead, where we list our editorial staff members. The prototype lists nine people; by March 24 it will list 25, including bureau staffers in Menlo Park, Calif., and Washington, D.C.

The tag line underneath the logo on page one reads, "The weekly for leading users of communications products & services." The key word there is *users.*

Network World's mandate is to be an advocate of the user: the communications manager.

We recognize that communications manager is a title that means different things in different companies. Despite the movement toward independent corporate communications departments, the role of communications manager is still frequently filled by MIS or DP personnel.

No matter who plays the role, the job is basically the same: coordinating the increasingly complex data and voice communications functions in an atmosphere of uncertainty and change.

With that in mind, we have designed *Network World* to address the job function, no matter what the job title.

To that effect, one of our five regular sections is entitled "Communications Manager." It features both staff- and user-written columns that discuss situations you encounter on a daily basis.

Our "Industry Update" section keeps you abreast of what the important companies and individuals within those companies are up to. It also features a "Vendor View" column, written from the vendor perspective, a perspective communications managers frequently encounter.

"Data Delivery" features news and staff and outside contributor columns as well as product announcements on data communications products such as modems, multiplexers, network processors, network management control systems and others.

"Telecom Trends" covers the transmission part of communications, from local-area networks, private branch exchanges, central office switches and key sets to long-haul communications networks and services.

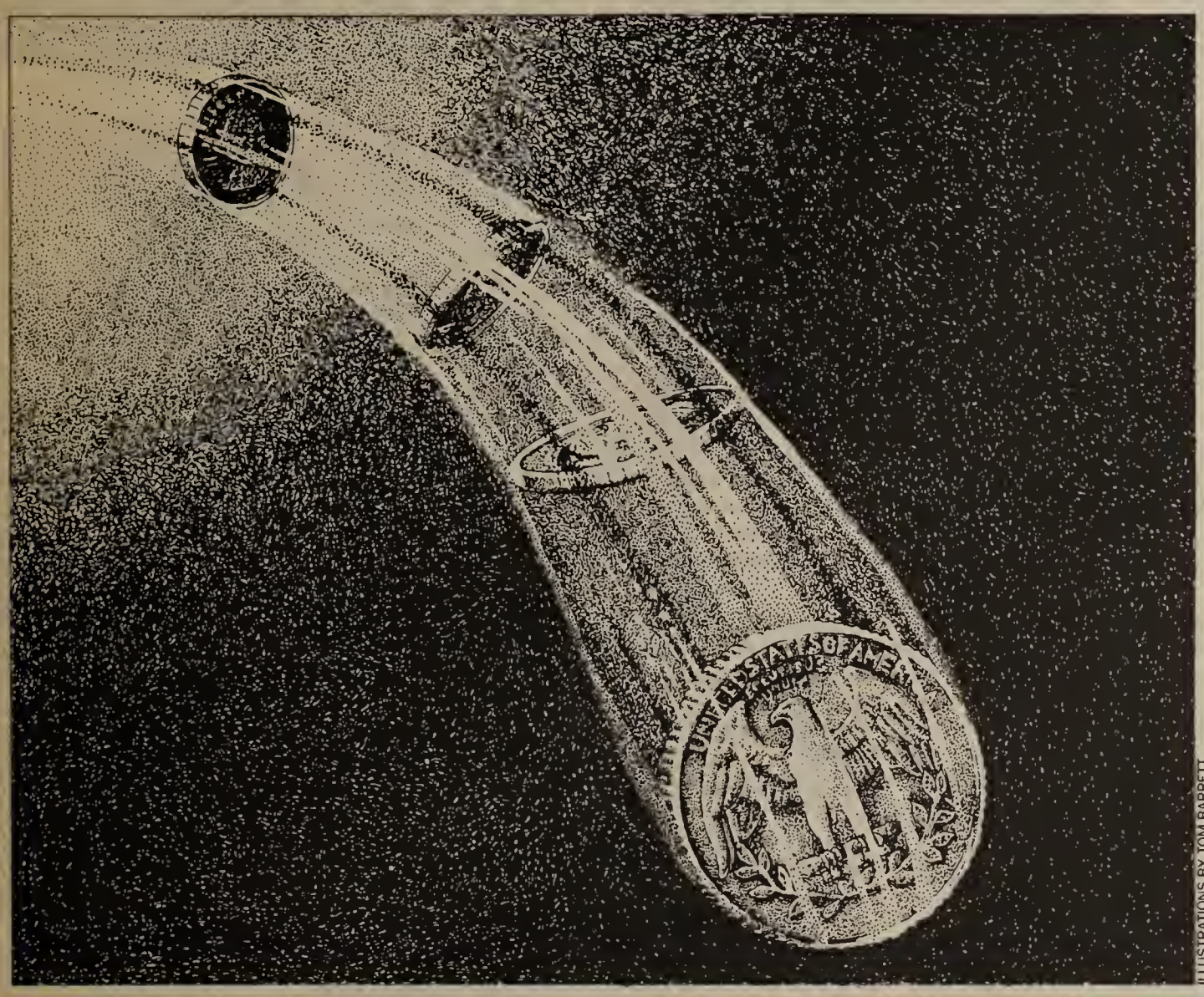
In view of the recent explosion of manufacturing networking, we dedicate our fifth section to "Factory Communications." The Manufacturing Automation Protocol has spawned a new generation of compatible computer communications that will impact communications managers in factory environments everywhere.

Our substantial features section provides you with a host of personality profiles, application stories, special sections, product focuses, technology and trend analyses, vendor profiles and maybe even an occasional fiction piece dealing with a nonfictitious topic. Be prepared for a wide range of good reading.

Again, welcome to our prototype. Starting March 24, *Network World* will appear each week, providing its readers with user news and features that simply weren't available before.

We look forward to seeing you then.

flip out over ISDN?



ILLUSTRATIONS BY TOM BARRETT

TECHNOLOGY
IAN ANGUS

Stay the course with CBX III

The hottest subject in the telecommunications gossip circuit these days is the rumor that IBM's Rolm Corp. will soon launch a new-generation digital private branch exchange. The CBX-III is said to be incompatible with all currently installed CBXs and CBX-IIs. One trade paper gave the story a front-page headline, citing two unnamed former Rolm employees and a consultant as sources.

According to the rumor, the CBX-II's architecture has reached a dead end. In order to be compatible with the new integrated services digital network standards, Rolm must adopt techniques standard in the industry for digitizing voice, and this will force a total change in the architecture of the system.

What's wrong with this rumor is that, regardless of the technical arguments there might be for such a change, introduction of a totally new achitecture would be a marketing disaster for Rolm.

Most digital PBX systems sample voice 8,000 times a second and encode each sample into an 8-bit word, so it takes 64K bits (8000 x 8) to encode one second of speech. As a result, most digital PBX architectures are built around standard 64K bit/sec time slots.

But Rolm's CBX systems sample voice 12,000 times a second, and use 12 bits to encode each sample. Because the first CBXs were built from a 16-bit minicomputer, Rolm's time slots carry 192K bits (12,000 x 16) per second.

ISDN, the rumors say, will use 64K bit/sec channels, and Rolm must conform. But that will make all existing hardware and software obsolete, handing an enormous advantage to AT&T, Northern Telecom, Inc., Mitel Corp., NEC Telephone, Inc. and others who have industry-standard architectures.

This type of argument appeals strongly to people who believe that what a product does is less important than how it does it. These architecture bigots are also responsible for much of the fourth-generation PBX talk we've been subjected to in recent years. They produce a lot of diagrams and charts, but very few real products that actually perform useful functions.

Rolm, by the way, has its share of architecture bigots. They're just as wrong as the others — Rolm's architecture isn't better or worse, it's just different.

Rolm started life as a computer company, and the CBX's architecture reflects that: It has the DP bias in favor of brute force processing power, which contrasts with the telephony bias that favors elegant use of limited resources. As a result, the CBX will never win any telephone industry awards for elegant architecture.

But that is irrelevant. Rolm has learned to connect effectively with telephony's 64K bit/sec world. Rolmphones actually use standard 64K bit/sec encoding techniques — the conversion to 192K only occurs inside the CBX. And the CBX's T-1 interface is one of the most flexible in the industry. Unlike companies with more orthodox architectures — Northern Telecom's

Continued on **page 14**

Angus is president of the Toronto-based Angus Telemanagement Group, Inc., and editor of Voice-Data Report.

CON:

BY W. SPENCER RICE
Contributor

The hyperbole surrounding integrated services digital networks is disguising the real truth: the lack of standard interfaces and the existence of electronic tandem networks renders ISDNs unnecessary.

The "con" argument:

There is no lack of articles in the trade journals citing the coming of ISDNs to the U.S. and the world community. Likewise, there is no lack of claims by major DP and communications suppliers that their products and services will support the as-yet-undefined Consultative Committee on International Telephony and Telegraphy ISDN standard or standards.

The movement toward ISDN comes from the European community, which is just now entering the world of digital communications, both voice and data. It should not be surprising then that there is strong interest in international standards for voice and data transmission in a more modern digital network world. This profile differs greatly from the one enjoyed by the U.S. corporation. Why then, should there be a need for ISDN in the U.S.?

The following are the most often listed advantages of an adopted ISDN standard:

- Reduced cost of a combined voice/data network;
- Flexibility of a national and regional Bell operating company ISDN-compatible public network, in other words, universal availability;
- Guaranteed compatibility;
- Faster call set-up;
- Wide bandwidth;
- Compatibility with European and Japanese ISDN networks;
- Cost-effective networking for small- to medium-sized businesses;
- Network management and control deferred to public and/or value-added network providers.

Separate voice and data networks almost always make sense because each is optimized for its own particular activity. Some excess capacity is designed into a network to cover peak demand now and in the future.

The flexibility of the public ISDN network or networks looks attractive when the flexibility of private networks comes into question. ISDN flexibility accrues, however, only when: first, it is in place; second, the ISDN interfaces between RBOC, local access and transport area and AT&T Communications backbone networks have been worked out; third, enhancements to private network flexibility have not also evolved.

The first and second have not happened and will not happen, in terms of attractive, universally available services, until the next century. As for parallel evolution of new tools for private nets, there is direct T-1 for all major private branch exchange models; Computer-to-PBX Interface and Digital Multiplexed Interface standards; on-demand 56K bit/sec service (soon on-demand T-1 and T-3); heterogeneous AT&T Information Systems and non-AT&T Electronic Tandem Network-type PBX networks and so on.

ISDN offers the hope that equipment and network providers will use standard ISDN chip sets, all working on the same defined standard

Continued on **page 14**

Rice is the senior partner of S&R Consultants Ltd., Madison, N.J.

WASHINGTON, D.C.

ALAN PEARCE

Karl Brimmer: the man behind the chairman

Chairman Mark Fowler of the Federal Communications Commission, who celebrates his fifth anniversary as head of the FCC in May, is well-known for his clearly defined policies designed to achieve competition both internationally and domestically. But what is of equal importance to him is his reputation as an effective and efficient administrator.

One of Fowler's top aides, who works vigorously and quietly in both managing the FCC and its policy-making process, is Karl Brimmer, a little-known 10-year civil service veteran.

Although most people outside the FCC haven't heard of Brimmer, he is perhaps one of the best-known staffers on the inside, largely because of his closeness to Fowler and the agency's managing director, Ed Minkel, and because of his management responsibilities.

Few people realize that the workday starts very early for Brimmer and his two bosses, Fowler and Minkel. They meet at 6 a.m. every workday — and sometimes on the weekends — at a local gym to "pump iron" for about 40 minutes. Brimmer, who is a fitness freak, is regarded as the chairman's weight lifting coach, so the traditional boss-aide relationship is turned full circle in the gym.

Once at the FCC, Brimmer takes over as chief of the Management Planning and Program Evaluation Office, where he is primarily responsible for seeing that the FCC works efficiently and meets its important policy-making deadlines.

Since joining Fowler's team at the very beginning, Brimmer has worked closely with the five commissioners, Ed Minkel and the FCC's bureau and office chiefs to establish the chairman's management objectives.

Brimmer, who is also the National Security and Emergency Preparedness Advisor, has spearheaded a comprehensive review of the FCC's rules. Of the 3,767 rules reviewed:

- 15%, or 566, have been eliminated or are proposed for elimination;
- 46%, or 1,738, have been modified and simplified, or are proposed to be;
- 39%, or 1,463, have been retained.

In addition, Brimmer has been in the forefront of reducing the so-called burden hours, (or number of hours spent both within and outside the FCC on FCC-related activity), on the public and industry by 49%, from 27.3 million in 1981 to 14 million in 1985. All of this has been done with a significantly reduced work force — down from 2,225 in 1980 to 1,962 today.

Meanwhile, productivity in the FCC is up by more than 13%; speed of service has been increased 24%; and pending applications have been reduced by 24%.

As National Security Advisor, Brimmer works closely with Chairman Fowler, Minkel and Commissioner Mimi Weyforth Dawson, liaison with the Department of Defense, on sensitive issues relating to security as well as defense.

Brimmer receives top dollar as a bureaucrat — $69,000 a year — and has also written various articles on telecommunications common carrier policy, regulation and information science and technology. In his 10-year career with the government, Brimmer has spent seven years with the FCC (two separate stints), and three years with the National Telecommunications and Information Administration.

It is not surprising that Brimmer, who is 37, gets on well with Fowler, a native of Florida. Brimmer, who is from Georgia, and Fowler are alumni of the University of Florida, where Brimmer studied operations research, engineering, statistics and mathematics as a graduate student.

Fowler and Minkel privately refer to Brimmer as "mighty mouse" because of his enormous energy and relentlessness in pursuing the chairman's efficiency and management goals. He is a keen competitor, and the chairman appreciates that as much among his staff as he does in the marketplace.

Brimmer is one of a number of hidden gems who are seldom seen or heard from, but who nevertheless carry great weight and take on the responsibilities of the day-to-day management at the FCC. This is especially important while the FCC grapples with difficult and complex policies as the telecommunications-information industry moves toward a more deregulated and more competitive environment.

It is people like Brimmer who have to pursue the FCC policy goals while taking responsibility for bringing systematic agencywide management to the FCC.

Although he has been highly successful, Brimmer has to be content with private praise and appreciation from Fowler and Minkel. There are few others within the telecommunications industry who realize that he even exists. But these are the qualities that make a good aide and an effective bureaucrat.

Brimmer is a true and talented professional who could hold his own in any business enterprise.

In an age when it is perhaps fashionable to knock the bureaucracy, we should take note that most civil servants do their jobs well — and with pride.

If more of us took note of that fact and attempted to understand the difficulties involved in managing the policy-making process, then there would be less criticism and more appreciation for the work load of the vast majority of our unknown and unrecognized public servants.

Pearce is president of Information Age Economics, Inc., Washington, D.C., and a regular columnist with Network World.

Technology from **page 13**

SL-1, for example — Rolm can mix voice and data on T-1 channels.

ISDN will offer 64K bit/sec channels as Basic Access and will multiplex 24 of them in the Primary Access — and Rolm already connects effectively to today's equivalents. From the point of view of functions actually delivered to end users, Rolm should have no more difficulty in adapting to ISDN than would any other manufacturer.

Rolm may even find it easier. The ISDN standards call for 2B + D — two 64K bit/sec information channels and a 16K bit/sec control channel — as the basic link.

That's a total of 144K bit/sec, but when allowances for overhead are added in, the standard actually requires 192K bit/sec, which is exactly the bandwidth of the Rolm time slot. That could easily lead one to the conclusion that Rolm may be able to pass the full 2B + D signal from the network to stations. This would require major modifications, but it might well be accomplished in an evolutionary way, preserving the bulk of current customers' capital investment.

PRO:

From **page 12**

private alternative networks.

- International standards also mean ISDN customers will be able to make their choice of equipment without concern for communications compatibility — or obsolescence. The two types of ISDN now endorsed by international standards-setting committees can be supported together in the local telephone exchange.
- The wiring that will bring ISDN into homes and offices is already in place. For Centrex customers like McDonald's, the migration to ISDN will be a virtually invisible process.

Companies like Illinois Bell are at work around the globe to make ISDN a reality in this decade. The French predict that 95% of their country will have connectivity by 1995. West Germany plans to have an all ISDN-using nation by 1990. Japan and Italy have both launched ISDN trials; they join Canada and Great Britain in actively planning ISDN offerings nationwide.

In the U.S., several regional holding companies spun off from the former Bell System have announced plans to introduce ISDN into their networks.

In the Great Lakes region, Ameritech has two ISDN efforts under way that conform to international standards: Illinois Bell's 1986 trial with McDonald's in the Chicago area and Wisconsin Bell's demonstration of ISDN features in a traveling road show.

ISDN offers both choices and control on a scale difficult if not impossible to achieve from a single-vendor network alternative. At the same time, it offers customers an orderly evolution from voice-only to integrated voice/data environments.

CON:

From **page 13**

protocol or protocols. What protocol are we talking about? There is currently no agreement within the CCITT on protocols, only recommendations. U.S. tests by AT&T and the RBOCs will support the CCITT recommended basic access interface, providing two voice/data channels of 64K bit/sec each, plus a 16K bit/sec signaling channel.

They will also use the Primary Rate Interface recommendation of the CCITT, based on the North American T-1 and DS-1 standards developed by AT&T and the BOCs. But, the RBOCs will not initially offer this primary access, which many larger businesses could use. So much for "wide bandwidth."

Access to ISDN networks does not mean compatibility for dissimilar devices.

What this means to the end user or corporate manager of DP, information services or telecommunications is that only devices supported by the same manufacturer will communicate well in an ISDN.

Several alternatives to ISDN provide net designers tools to effect terminal-to-processor, processor-to-processor and terminal-to-terminal communications: CPI/DMI standards, ETN standards, X.25 and X.75 networks and Synchronous Data Link Control and Systems Network Architecture gateways.

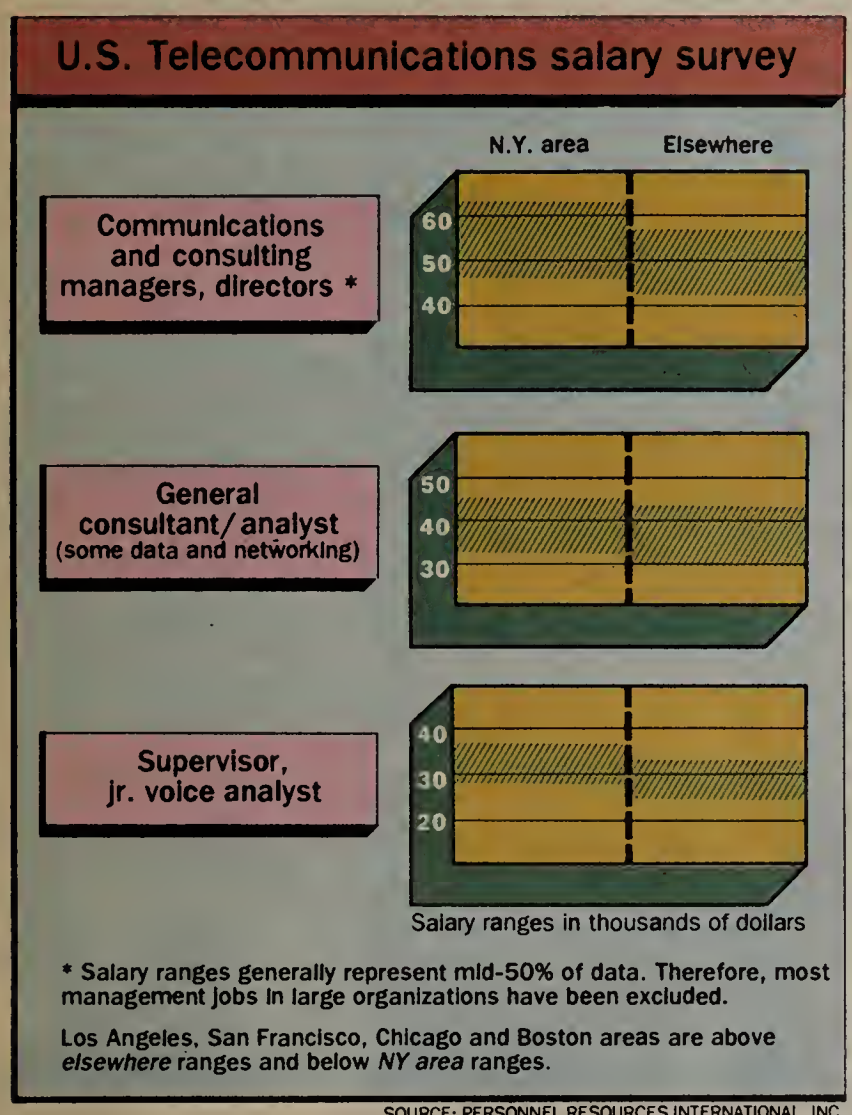
Many of these alternatives solve specific problems, and many will offer multilayer protocol compatibilities. For international standards, it appears that the International Standards Organization's Open Systems Interconnect model will be available soon.

For flexibility, it will be hard to beat the virtual networks planned for enhanced Centrex by the RBOCs.

COMMUNICATIONS MANAGER

"One of the things that got us to the door of the executive office was to audit the communications expenses for the entire organization. We went in to executive management, before divestiture, and said, 'Do you know that you are spending $3.5 million a year for communications, and after divestiture you could be spending over $5 million a year?'

Arthur Kohne
telecommunications systems vice-president
First National Bank of Maryland
Baltimore



SOURCE: PERSONNEL RESOURCES INTERNATIONAL, INC.

THE SUCCESSFUL MANAGER

Ten tactical errors to avoid

Networking and staffing errors can lead to unnecessary expense for the unwary.

BY MARGIE SEMILOF
Senior Writer

Although communications managers are increasingly aware of low-cost networking options and available equipment features, they still make a number of avoidable networking and staffing mistakes, according to a telephone survey of telecommunications consultants.

High on the list of tactical errors is the failure to keep up-to-date on new technology, such as merging voice and data. Another common mistake is running back to the Bell System just because it is familiar.

According to Frederick R. Feldman, president of the Feldman Group, a New York-based consulting firm, many users miss out on big savings because they refuse to investigate options and available products.

Feldman also claimed that his firm handled 22 do-over projects last year. Do-over projects are those that the user did wrong the first time.

"A lot of managers get involved in areas where they have no expertise," Feldman said. "They are afraid to tell their boss they cannot do the work."

Continued on **page 18**

SURVEY

Salaries increased 7% last year

Communications and consulting managers and directors in major metropolitan areas should expect to earn between $47,200 and $63,100 yearly, according to a telecommunications salary survey released by the New York-based placement firm, Personnel Resources International, Inc.

These figures compare to a range of $33,400 to $46,200 paid to general consultants and analysts.

The survey also reported that a junior voice analyst should expect to earn between $29,400 and $37,500. Overall, salaries increased about 7% throughout the industry last year.

According to Jay Jacobson, president of Personnel Resources International, shortages continue to exist for electrical engineers and computer scientists with appropriate college degrees and one to seven years of experience.

He claimed that experienced technicians who have worked on preferred private branch exchanges, data, satellite or radio equipment are hard to find. These individuals may command base salaries of $30,000 in some metropolitan areas.

GUIDELINES

BY MARGIE SEMILOF

Lack of quality training deserves attention

Trained personnel who can capably run a voice/data integrated network are rare. And truly useful seminars for educating people currently in the industry are even rarer.

With this in mind, managers are realizing the importance of investing in local university programs. Corporations now work hand-in-hand with colleges and universities to develop telecommunications courses, including certificate programs, four-year baccalaureate and master's degrees in engineering, policy planning or design. Programs can benefit companies by creating a pool of trained personnel and by updating employees.

Even corporations in parts of the country not close to major technological centers are banding together to start their own programs. Federal Express Corp., RCA Cylix and Holiday Inn Corp. provided one good example by creating two centers for telecommunications studies at colleges in Memphis, Tenn., and Jackson, Miss.

Most managers agree that it seems senseless to shell out money on a crash course. Lacking alternatives, they do it, hoping that the return will be a skilled, upgraded employee that can map out an extensive network.

Unfortunately, those hopes are about a mile too high. In addition to being a costly way to educate your staff, managers are finding that fewer and fewer get-smart-quick sessions are worth missing a day of work.

Managers brushing up on technology at industry trade shows also get short shrift. In many cases, those classes turn out to be taught by vendors — a subjective approach, indeed.

Not every seminar is a disappointing experience. As a way to sort out the best and the worst, *Network World* has developed a rating system for existing courses. So, if you attend a seminar that you care to rant or rave about, why not let us know? Everyone can benefit by hearing which educators are worthwhile and which should be avoided.

DIALOGUE

What is the most important thing communications managers can do to promote themselves within their own companies?

"Our image is made or broken every day simply by getting our work done. One of the best things we can do is to communicate the status of our system to our users if we anticipate a problem. We must have well-prepared presentations to sway people who do not care one way or the other."

William Stewart
operations manager
District of Columbia Public Schools
Washington, D.C.

"[We can do] the same things any manager would do. Senior management is always concerned with cost-effective decisions. Either the management of the DP department or the communications manager should stay current on how products can benefit the organization. It also depends on the organization and what they are trying to do."

Bruce McGee
vice-president of DP
Caribank, Dania, Fla.

"As the cost of communications rises, so does the importance of the manager. You will be recognized if you can get more functionality out of the corporate dollar."

John Murray
manager of operations
Keyes Fibre Co., Waterville, Maine

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northern telecom

Errors from **page 15**

While it may be common for a communications manager to be underprepared, it is possible, on the other hand, to study a problem to death.

Users must find a happy medium between not doing enough research and doing too much.

Some consultants noted that because the communications field is a moving target, the chance of finding perfection is slim.

On occasion, it may be better to implement the second-best or third-best option than to go on studying the problem forever. .

Michael T. Hills, president of Hills Telecommunications Consultancy in Burtonsville, Md., pointed out that simply not checking the monthly bill thoroughly is another user oversight.

"Users may not be getting the service they originally subscribed to, or the rates may have changed," Hill warned.

"Also, the route selection may not be operating optimally," he added.

Users should also be aware that the chance of overlooking errors increases significantly as phone bills continue to change in appearance. If the customer feels a bill seems too low, it is better to check and weed out the problem early, rather than face being slapped with a huge figure several months later.

Philip J. Freedenberg, executive vice-president of the Vienna, Va.-based Federal Engineering, Inc., advised users to avoid buying equipment and services on price alone.

"The lowest bidder is not necessarily the best for the job," he said. "You may be getting comparable equipment, but not comparable service."

Another common mistake is undersizing a system. This is important in terms of lines ordered and traffic handling capabilities. Companies tend to grow far beyond their expectations. The communications manager must fully understand his organization so an accurate specification that will reduce costs and improve efficiency can be written.

Richard Kaufman, president of Richard N. Kaufman & Associates, Ltd., Rowayton, Conn., advises customers to learn to write a request for proposal, rather than asking the vendor to make an offer. He also advised users to double-check the availability of the products and services that the vendor wrote into the request for proposal.

"If the vendor writes a proposal, the user ends up receiving different sets of responses, none of which can compare to each other," Kaufman said.

The consultants offered additional suggestions that should help the communications manager provide the best possible service for his company.

- Try not to concentrate expertise in the head office. Spread a little to the branch offices.
- Folks on the DP side of the house frequently build their own departments and empires. If the divisions must be separate, there must also be dialogue between them.
- Do not rely on vendors as a single source of information.
- If a vendor says there will be no problems, doubt it. Be sure to ask to see features demonstrated, and ask how they fare in different sets of circumstances.
- Know the limitations of your department and your people.
- Do not presume that the vendor will train your people in the best way to suit the design of your installation.

The corporation can take a number of steps to alleviate problems and allow the communications manager to do his best.

One monumental error is perceiving the communications function as an overhead expense or liability instead of a strategic resource or an asset.

Consultants claim that the time spent putting out small fires, like fixing telephone sets, often gets in the way of the much needed in-house research and development that is necessary to running a smooth and efficient network.

Try to provide enough staffing in the communications department so the manager is not bogged down with small chores. The tasks of the communications manager must be handled on a full-time basis. This is not a part-time job.

Despite this high number of errors, managers are improving their skills in a variety of areas. They are working harder to educate top management on communications issues and are training employees to do basic equipment installation.

According to Clifford Worth, a consultant with Arthur D. Little, Inc., a Cambridge, Mass.-based consulting firm, managers are also shining in their knowledge of cabling and inventory management.

"They used to receive a bill for telephones and services," Worth said. "Most managers had no idea where those phones were located."

Kevin McCarthy, a telecommunications strategic planner with Arthur Andersen & Co., a Philadelphia-based accounting firm, reported a developing trend. "The telecommunications manager is studying how communications affects the company's total business instead of concentrating solely on technology," he said.

"Managers are also beginning to view themselves as professionals," he said. "They are improving their people skills."

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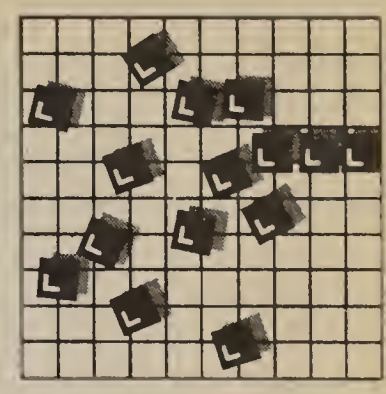
DATA DELIVERY

Introducing: Product reviews

John Hunter, president of the Devon, Pa.-based consulting firm, TMS Corp., will be a regular product reviewer for **Network World.** During his 18 years in the communications industry, he worked at such firms as Infotron Systems Corp., Data Decisions and Auerbach Corp.



PRODUCT REVIEW

T-1 mux on the upgrade

BY JOHN J. HUNTER
Contributing Writer

Digital Communications Associates' Netlink T-1 multiplexer product line handles a wide range of synchronous data inputs, has a fine voice facility, and its menu-driven software is easy to follow and use. During the past two years, DCA has greatly improved the product by adding a drop-and-insert facility and making the message frame format compatible with AT&T's D4.

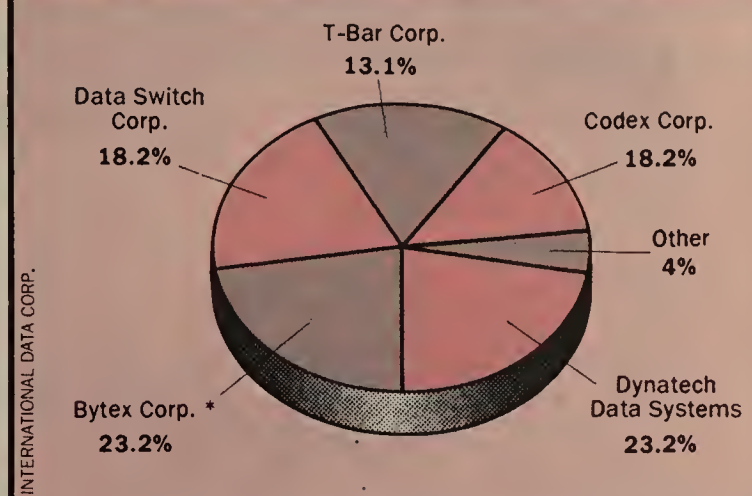
Netlink is offered in two versions: Series I and Series II. Both employ bit-interleaving, have the same number of maximum input channels (128), are configured and controlled via an Ascii terminal and can be equipped with redundant control logic and power supplies. Such redundancy guarantees that the failure of either primary unit will not bring down the entire system.

The Series II is by far the more powerful and flexible of the duo. It can be configured as a drop-and-insert system; it permits different operating configurations to be stored and activated manually or at a predetermined time of day; and it supports the D4 extended frame format required for connection to the Accunet T1.5 Service. The Series I does not support this extended frame format, which means it can only be used with private facilities. While this in no way diminishes the product's overall operation, it does reduce its flexibility. A Series I, however, can be upgraded to a Series II by merely changing the control logic.

Netlink handles synchronous data and voice channels directly. Users wishing to interface asynchronous devices must either use a submultiplexing device such as a time division multiplexer or statistical multiplexer, or an asynchronous-to-synchronous converter.

Continued on **page 21**

U.S. Matrix switch market share 1984 shipment revenue



SOURCE: INTERNATIONAL DATA CORP.

* Note: Bytex Corp. revenue includes switch sales to Northern Telecom, Inc., which amount to approximately 25% of total.

DATA DIALOGUE
BY PAUL KORZENIOWSKI

Who's in charge of local nets?

Abbott and Costello would probably have felt right at home in many large companies. Corporations are substituting the twosome's famous "Who's on First?" skit with another skit entitled, "Who's in Charge of Personal Computer Local-Area Networks?"

"In most corporations, no one has taken charge of managing personal computer local-area networks," said Louise Herndon Wells, a local network analyst with Dataquest, Inc., a San Jose, Calif., market research firm.

The continuing march of technology has blurred corporate boundary lines. As technology has spread to the corporate masses, so too has much of the responsibility for ensuring that the technology functions properly.

Similar problems emerged a few years ago with the advent of microcomputers. At that time, there were no clear-cut lines of responsibility for personal computers, yet users needed training and a safety net as they jumped into the technology.

Obviously, the DP department was not equipped for this. In most large corporations, a new group emerged. Called the corporate support center or micro help center, these groups trained micro users and helped ensure that the company's micros kept running.

Presently, corporations are being forced to solve these problems with personal computer local nets. Many companies are learning that the maxim, "If it ain't assigned, it won't get done," holds true.

"Whoever takes the role of network administrator usually does so reluctantly," noted Herndon Wells. "The position entails a lot of headaches and often little or no more money."

Sometimes, this person comes from the department working with the local network. In other cases, the micro support center accepts the responsibility, according to Kim Myhre, an analyst with International Data Corp., a Framingham, Mass., market research firm.

Myhre predicted these will only be stopgap solutions. "Once personal computer networks establish links to larger systems, management of the network will revert to the MIS department," he said.

Corporations may want to move responsiblity to the operations department now rather than wait. Analysts have projected 30% to 40% annual growth rates for the number of users. Tools now being used for larger networks will rapidly emerge for the personal computer local nets. By placing the responsibility in the operations area now, communications managers could eliminate future confusion.

IBM INSIGHTS

Possible wedding bells? To date, IBM has been unwilling to make any type of commitment to the integrated services digital network. But Big Blue plans to begin courting ISDN this spring. Mary Johnson, an analyst at the Yankee Group, a Boston-based market research firm, said that a senior IBM telecommunications manager is scheduled to speak about IBM's ISDN plans at a spring Yankee Group seminar.

Full-speed ahead. MCI Communications Corp. is proceeding full bore on the assimilation of Satellite Business Systems. When the project is completed sometime in March, approximately 75% of the satellite vendor's customers will have been moved to the MCI fold.

Also, more than 150,000 circuits leased from AT&T will have been traded in for MCI lines. The transmission supplier's marketing campaign will focus on its budding relationship with IBM. There is a possibility that IBM will increase its financial stake in MCI from 16% to 30% by summer's end.

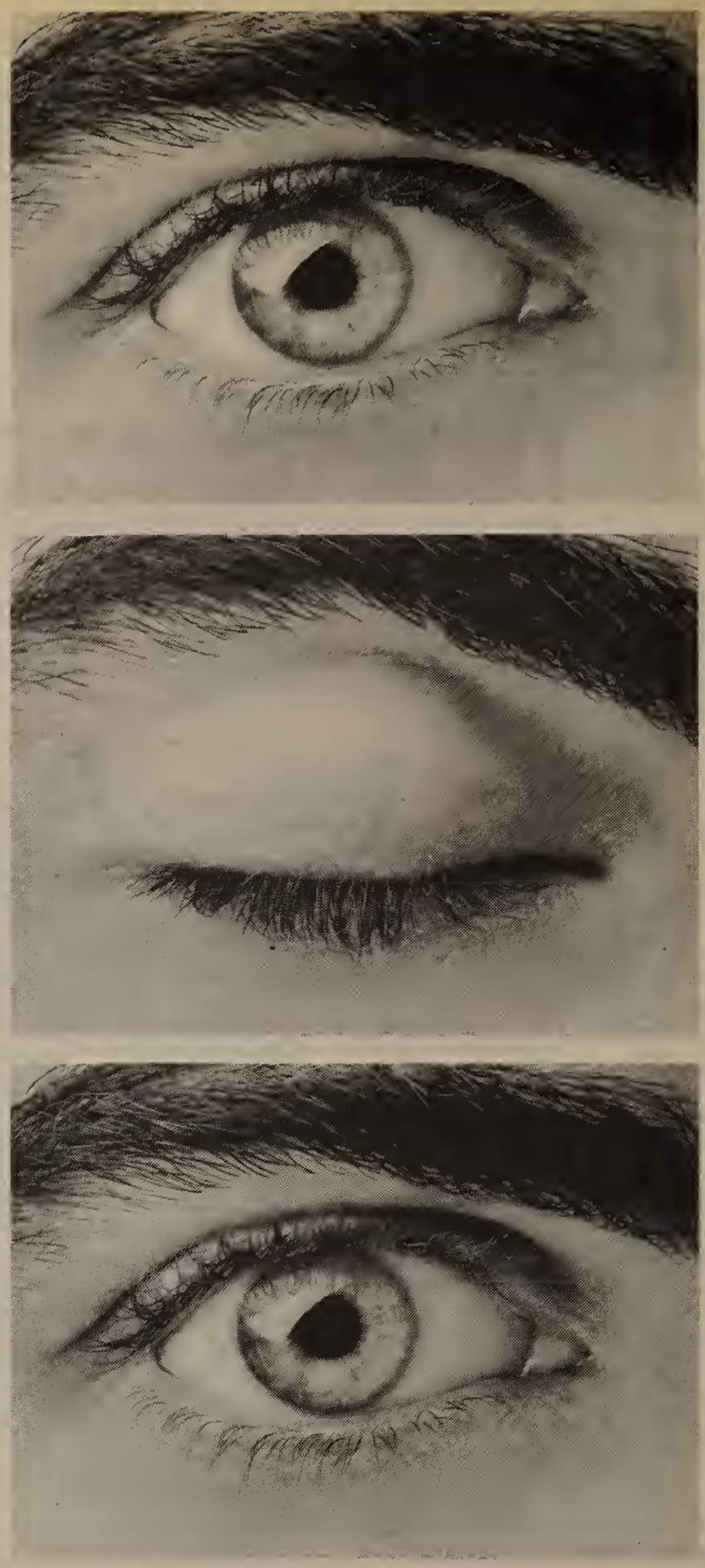
Bye-bye big guy. A betting man could have made a lot of money wagering on the departure of Ken Oshman, president of Rolm Corp. Rolm's maverick corporate style, never considered true blue, reflected the president's persona.

For the past six months, Oshman, usually one of industry's more accessible leading lights, has been unavailable for comment and hidden in the halls of the Santa Clara, Calif., company. The departure is the latest in a series of moves IBM has undertaken to meld the two companies' product lines.

Users, often faced with bids from IBM salesmen, Rolm salesmen and various distributors and value-added resellers, have been pressuring Big Blue to clean up its product lines and distribution channels. The next step will be the incorporation of Systems Network Architecture support into Rolm's CBX line.

More than a token gesture. Despite the IBM Token-Ring Network's shortcomings, corporations large and small are welcoming it into their offices. It appears that users displayed Job-like patience and waited for the oft-rumored product to be announced before placing their network orders.

Vendors are rushing to market with software, gateways and compatibles that should increase the network's attractiveness. The Token-Ring Network could replace the IBM cabling plan as a product that no one seems to respect, yet everyone seems to own.



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GTE Telenet

T-1 mux from **page 19**

Another popular trick for handling asynchronous data is to employ a synchronous channel card and clock the data in at four times the data rate. Frankly, we don't care for any of these approaches.

Devices such as submultiplexers and asynchronous converters run up the overall cost of the product, and oversampling a synchronous channel wastes bandwidth. In addition, when a submultiplexer is used, a failure of that device will bring down every component attached to it. DCA recognizes the value of having a separate asynchronous data card and is developing one.

The synchronous channel cards are fairly impressive. All handle half- and/or full-duplex data rates of 50 bit/sec to the speed of the composite link, and all are four-port units. The synchronous channels can also be configured to operate in what DCA calls "bypass mode." Here, a channel can access the trunk without first being multiplexed. Thus, without appending the framing overhead, more data can be transmitted. Bypass is extremely attractive for operations such as CPU-to-CPU file transfers.

DCA will soon introduce two new options specifically designed for handling satellite transmission problems. The first, called an analog phase lock-loop board, allows the user to tune the channel to the analog characteristics of the modem. This not only provides a finer tuning range, it also should do a good job of compensating for phase jitter associated with satellite transmission. The other new product is a first-in, first-out buffer for the channel side and link side of the multiplexer. The buffer has a 4K-byte capacity and compensates for satellite transmission delays.

For handling voice inputs, DCA has chosen the continuously variable slope delta (CVSD) quantization scheme for converting analog inputs into digital form. CVSD is a popular technique because it allows two voice channels to share a single data signal zero-level (DS0) 64K bit/sec channel slot in the T-1 composite. (There are 24 DS0 slots in the 1.54M bit/sec T-1 service). However, it has begun falling out of favor since AT&T announced that it would standardize on adaptive differential pulse code modulation.

The Series II is among the select group of products supporting drop-and-insert configurations. This is employed in networks involving at least three independent locations and allows the user to designate that specific channels are to be dropped at one location while other channels are inserted into the composite at the same location.

The entire composite is then sent to the next location in the network.

DCA has opted to employ back-to-back multiplexers with cable routing to handle the drop-and-insert operations. Here the entire composite is demultiplexed, and each channel is routed to a channel cabled to it.

This procedure allows channels designated for dropping to be easily picked off; the vacated time slot can then be used by data that is to be inserted.

A good deal of criticism has been levied at this scheme, due to the delays involved in the demultiplexing/multiplexing operations. DCA agrees that this is normally the case, but claims that its scheme causes negligible delays, which, it says, it can easily prove.

Overall, we'd rate the Netlink Series II as one of the better T-1 multiplexers on the market.

Its wide range of synchronous data speeds should meet the needs of most applications and the menu-driven software is easy to use.

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It is also backed up by a company that responds to user needs.

Hunter is vice-president of TMS Corp., a Devon, Pa., data communications consulting firm.

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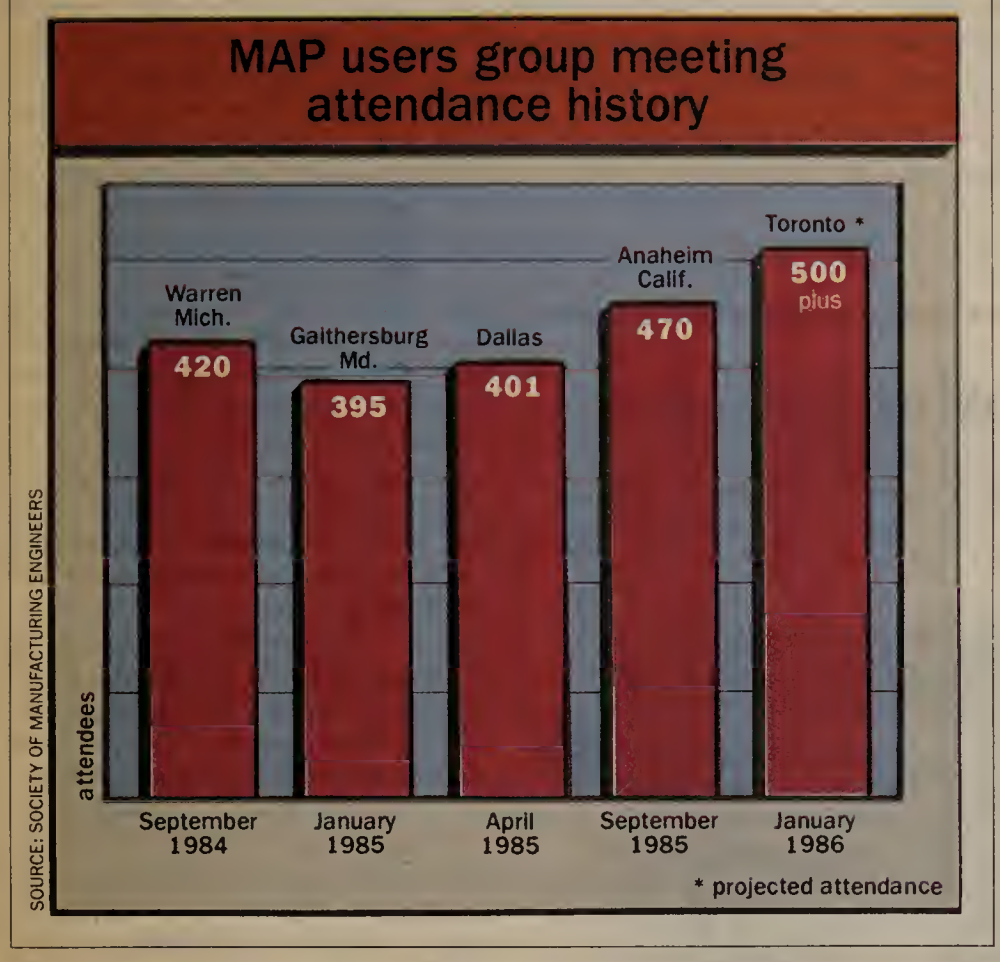
FACTORY COMMUNICATIONS

"We have learned quite a bit by planning a real system, as opposed to talking to vendors about MAP products."

Bob Yee
principal computer operations engineer
technical and industrial control systems
Ford Motor Co.



▶ MAP USERS GROUP MEETING

IBM, INI join in R&D pact

Multimillion-dollar deal inked to promote MAP technology

BY BOB WALLACE
Senior Writer

TORONTO — IBM Corp. took users by surprise at the Manufacturing Automation Protocol (MAP) users group meeting here on Jan. 15 by announcing a multimillion-dollar joint development agreement with factory network vendor Industrial Networking, Inc. (INI) of Santa Clara, Calif.

John Klein, IBM's general manager for manufacturing systems products, briefly described the company's intentions during the gathering's keynote address.

"The agreement, from our perspective, will be the basis of which the two organizations will seek to further improve and advance technology in the MAP area." Klein declined to give any further details on the new alliance.

Continued on **page 24**

▶ AUTO GIANTS COLLIDE

Ford barely on the map, GM leads in factory race

BY BOB WALLACE
Senior Writer

When the topic is factory communications, does Ford really have a better idea?

Ford Motor Co.'s prime competitor in the automotive world, General Motors Corp., pioneered the user revolution by powering the development of the Manufacturing Automation Protocol (MAP). This specification is designed to allow dissimilar vendor products to communicate on a single network on the factory floor.

Ford, the nation's number two auto producer, is taking much the same approach as GM in moving MAP from the drawing board to the manufacturing plant. But Ford's MAP efforts are being done on a much smaller scale.

GM has implemented numerous MAP pilot tests and has begun actual MAP network implementation at its Saginaw, Mich., Factory of the Future plant and at its truck and bus facilities. GM has been exploring the concept of carrier-band networks — small 5M bit/sec subnetworks connected to the 10M bit/sec backbone coaxial network. While GM has been in the MAP spotlight, Ford has been operating in GM's shadows, beginning only one MAP pilot test. A second pilot is currently planned.

Bob Yee, principal computer applications engineer for Ford's technical and industry control systems

Continued on **page 25**

FACTORY FACTS

- Manufacturing Automation Protocol specification version 1.0 released: October 1982
- MAP specification version 2.0 released: February 1985
- Current MAP specification: version 2.1. released: March 1985.
- IEEE 802.4 standard provides for systems running at three separate data rates: 1M bit/sec, 5M bit/sec and 10M bit/sec.
- Largest MAP installation under construction: General Motors Corp. Truck and Bus Division facilities locations at Pontiac and Flint, Mich.; Indianapolis and Fort Wayne, Ind.; and Oshawa, Ont.
- MAP/TOP user groups meet next during May in Seattle.
- The Society of Manufacturing Engineers publishes a quarterly newsletter for all MAP users group members called *MAP Interface*.

MAP TESTING

BY BOB WALLACE

Will the real MAP please stand up?

Vendors are putting the Industrial Technology Institute (ITI) in Ann Arbor, Mich., to the test.

ITI is the only organization that stands between overzealous MAP product vendors and confused users. The staff of ITI's Network Evaluation Center accepts networks or individual components from vendors and tests them in networking scenarios developed by the National Bureau of Standards (NBS).

If the products conform to the Manufacturing Automation Protocol (MAP) 2.1 specification, they receive ITI approval. Such a certification may mean millions of dollars to a vendor, since it can boast availability of a MAP-conformant device.

To MAP products users, ITI carries more clout than Underwriters Laboratory.

Robert Eaton, vice-president in charge of General Motors Corp.'s advanced engineering staff, underscored the importance of MAP-conformance testing organizations.

"The success of MAP is highly dependent upon establishing a comprehensive testing program," he explained. "An independent testing organization is needed to ensure the newly developed devices are truly compatible with the MAP standard."

Prospective MAP equipment purchasers should heed its warnings. Users should be suspicious of products that have been submitted to ITI, but have failed conformance testing. Users should deal cautiously with vendors who claim to have MAP products ready for shipping.

Confused users need not wait for the next MAP users group meeting for information on implementing MAP networks in their facilities. ITI offers MAP consulting services to assist users with problems encountered before, during or after installation of MAP systems.

Prospective MAP network users or users wishing to explore the possible advantages and disadvantages of installing MAP nets should put ITI to the test. For general ITI information, call (313) 769-4000. For specific information concerning ITI's MAP conformance testing, contact Andy McMillan, acting director of ITI's Communications Network Laboratory and Network Evaluation and Test Center manager at (313) 769-4582.

Ford, GM from **page 23**

INI is a joint development of Ungermann-Bass, Inc. and General Electric Co.

"I believe we are on the horizon of another industrial revolution," Klein said. "Hopefully, that will be an industrial evolution in factory communications."

INI President and Chief Executive Officer Joseph Schoendorf said of the agreement, "Our engineers and [IBM's] engineers have been at work for some time on MAP products."

Schoendorf said the pact had been finalized just hours prior to the beginning of the users group meeting.

"This is not something we decided to do yesterday," he explained. "It is a project we have been working on for the past year."

INI inked a second contract with IBM to use IBM's model 5531, 5532, 7531 and 7532 industrial computers as part of INI's MAP/1 product line. The pact will run for 18 months. According to Michael Gardner, INI vice-president of marketing, the second contract is valued at several tens of thousands of dollars.

IBM joined General Motors Corp. in support of MAP in 1981, but did not announce a MAP product until the Autofact '85 show in Detroit last November. At that time, IBM announced two MAP software programs designed to run on its Series/1 minicomputers. Series/1 minis are currently used in IBM pilot tests running at its Endicott, N.Y., Lexington, Ky., and Richmond, Va., manufacturing facilities.

Although the IBM-INI agreement has been hailed by many MAP watchers as a catalytic development in the MAP product marketplace, others are divided over whether IBM's entry into the arena will quicken or slow the development of MAP technology.

David Scott, computer-aided manufacturing systems department division manager for Deere & Co., said the IBM-INI marriage may hinder MAP development. "Sure, users will wait, just like they did on the IBM Token-Ring Network," he declared.

Scott, who helped establish a MAP network in the company's East Moline, Ill., John Deere Harvester Works plant, said Deere & Co. facilities use products developed by INI and 3M Corp.'s Interactive Systems division in addition to the Concord Data Systems, Inc. equipment in the East Moline plant. He said users may hold off on MAP test pilots to see what products the IBM-INI pairing will develop.

Chuck Gardner, head of the MAP/Technical and Office Protocol steering committee, said, "Users will wait for IBM to integrate its mainframe computers, minicomputers and Personal Computers with coaxial networks.

"I think IBM will offer us significant MAP solutions." he added.

Gardner, who is also director of information services for Eastman Kodak Co., announced that a new MAP pilot test taking place at Eastman Kodak uses MAP products from vendors such as IBM, INI and Digital Equipment Corp.

Asked to comment about the IBM-INI deal, Ed McCartney, local-area networks and communications product marketing manager for Honeywell, Inc., said it was good for the industry. "For IBM to become a MAP player, it had to have a product supplier," he explained. "IBM has begun to run with MAP."

Honeywell announced a pair of MAP pilot tests at the meeting, both of which are planned to be operational by September. The first is located in Phoenix and is a duplicate of the Honyewell MAP demonstrated at Autofact '85. The second pilot test is located at Honeywell's Gardenia, Calif., plant. McCartney compared the IBM-INI agreement with Honeywell's OEM agreement with Concord Data Systems.

"We needed Concord Data Systems because we don't have any [MAP terminal interface modules.]" Since software to connect nodes on MAP networks is scarce, systems integrators will make or break MAP, McCartney said.

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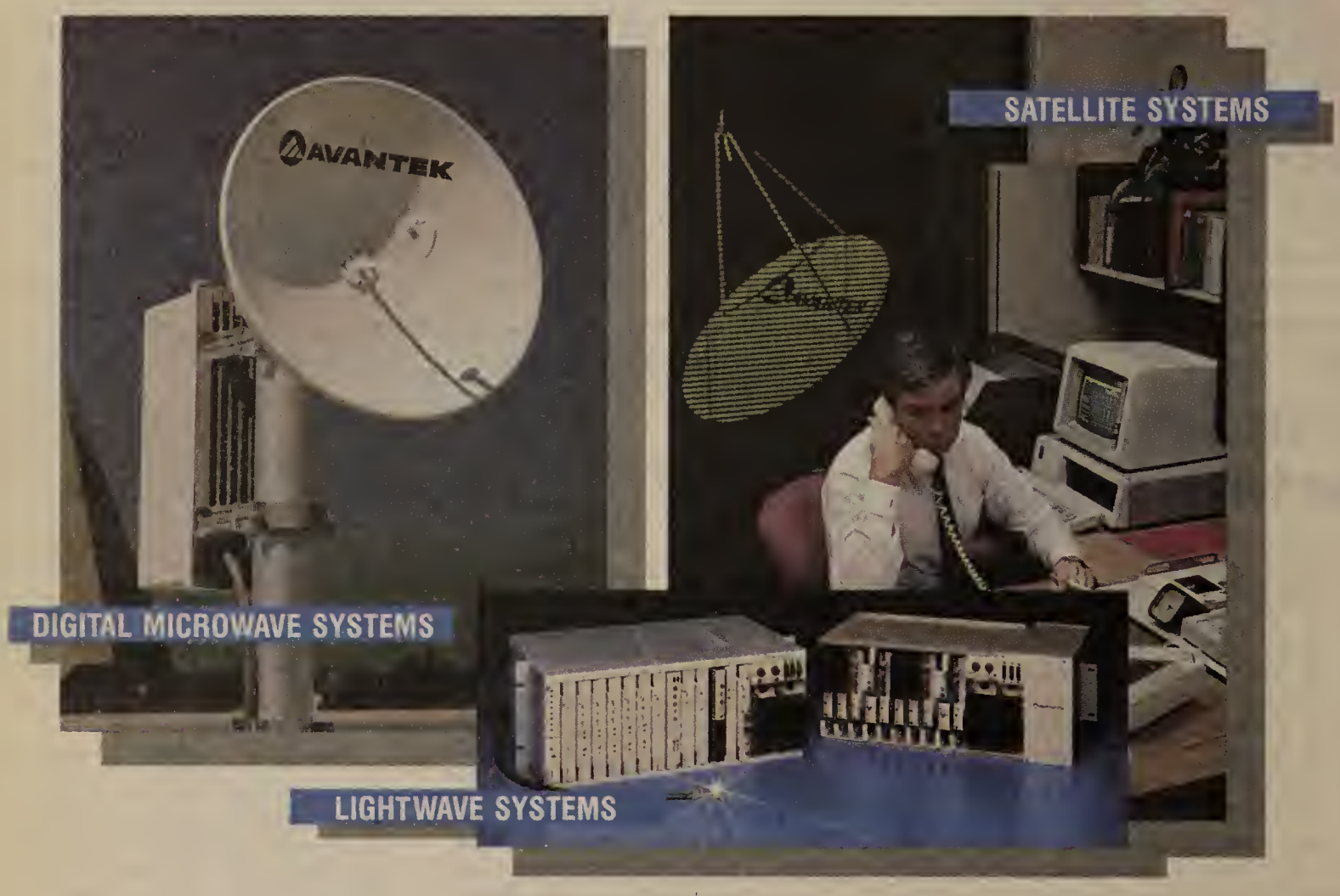

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Ford, GM from **page 23**
group, explained the company joined the MAP bandwagon in 1984 and has sent letters to its major computer and manufacturing products vendors telling them Ford wants to purchase MAP-compatible products in the future. Ford is one of several members of the MAP users group steering committee.

"We have decided to use one or two MAP pilot tests as learning mechanisms on the behalf of all of our divisions — rather than having each of our divisions intiating a pilot test of its own," Yee explained.

The first Ford MAP pilot, which began in June of 1985, is based on MAP specification version 2.1 and features a 10M bit/sec, token-passing bus, coaxial cable-based backbone network. The multivendor effort should be fully operational by mid-year, Yee claimed. He would not reveal the location of the pilot other than that it is in a manufacturing plant in the Detroit area.

Yee said a total of six MAP nodes would be connected to the backbone network and will involve 30 to 40 microcomputer or programmable controller-type devices. Some of the nodes could be loosely defined as cells or manufacturing areas, he said.

Carrier-band technology will probably not be a part of the first Ford MAP pilot test. "Carrier-band technology is the type of thing we might bring into Ford in more of a lab or nonproduction environment at first, in order to see how it behaves and in order to uderstand what the technology is," Yee said.

In operating the first MAP pilot test, Yee and others will be running interference for other Ford divisions, which are possibly planning to establish pilot tests of their own in the future. "What we are trying to do on behalf of the corporation is to deal with the MAP conformance-testing processes," Yee explained. This is an extremely murky issue, since little is currently known about what products conform to MAP version 2.1. There is also little known about which MAP-conformant products work with one another.

A second MAP pilot test, currently under consideration, would call on a set of vendors not involved in the first test to supply MAP equipment, Yee said. "We will be attempting to transfer things we are developing in the first pilot into the second one." He claimed other divisions, which have been watching the first test closely, will receive data generated from the test and will probably start to plan tests of their own.

Jim Conossen, manufacturing systems and operations research manager for Ford, explained non-MAP factory communications systems currently operating in the automobile maker's production and assembly facilities could be adapted to operate in conjunction with MAP networks. "Our thrust is to make sure that any efforts and investments being made have MAP in mind, so as MAP comes along, it will be easier to retrofit systems. We are making sure we are not taking actions now that will preclude MAP in the future."

Yee said it was too soon to speculate as to how Ford might implement the Technical and Office Protocol (TOP). TOP version 1.0 was announced at the Autofact '85 show in Detroit last November. The protocol was designed to provide a multivendor communications scheme for engineering and office applications. "We are evaluating the specification that has been developed by [Boeing Computer Services, Inc.] and are trying to assess what position we should take with TOP," Yee explained.

Conossen's advice to users considering creating pilot tests would be to "think big and start smart." Yee added it is important for users to be concerned about which vendors' products they will use in their tests or networks.

PRODUCTS

MAP series unveiled

Concord Data Systems, Inc. of Waltham, Mass., announced a series of factory communications products that reportedly comply with various layers of the Manufacturing Automation Protocol (MAP). The products offer MAP links and RS-232 terminal networking features.

They have not been tested for MAP version 2.1 conformance at the Industrial Technology Institute, an independent testing agency in Ann Arbor, Mich.

The **Mapserver/Plus TIM** is based on the company's four-port Token/Net Interface Module and has a RS-449 data link speed of 56K bit/sec. It is available in three versions.

The 5M bit/sec broadband unit costs $4,870. A 10M bit/sec broadband unit costs $5,845. The 5M bit/sec carrier-band model costs $4,500. The 10M bit/sec broadband and 5M bit/sec carrier-band units will be out in June.

Concord Data Systems, Inc., 303 Bear Hill Road, Waltham, Mass. 02154.

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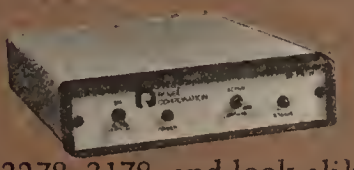

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*Data Decisions, "Protocol Converters—Bridge To The Future," February 1984.

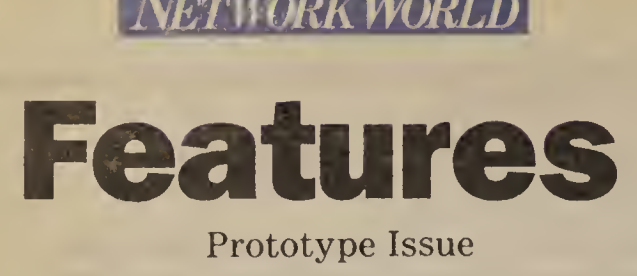
NETWORK WORLD

Features

Prototype Issue

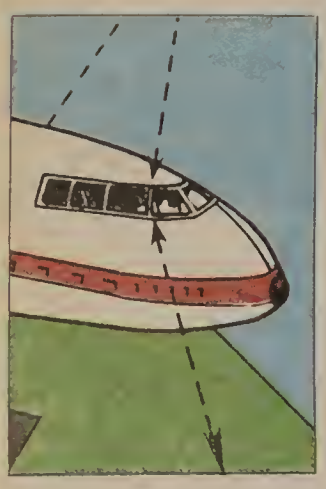
TCA president Prince I. Dyess
As president of the Telecommunications Association, Prince I. Dyess represents more than 2,200 western U.S. communications managers. He is a voice for professional improvement and education.

No shrinking violet, he speaks out loud and clear on the issues that most directly impact TCA members. **This page.**



Joining the software-defined generation
As an early user of software-defined, or virtual, networks, soft drink giant Pepsico, Inc. found it doesn't take a huge corporate presence in a geographical area to justify these new networks. Why? Because networks can be built node by node. **Page 37.**

Product focus: 2,400 bit/sec modems
The 2,400 bit/sec modem market has been among the industry's hottest during the past year. Vendors claim it would be even hotter if the value-added networks supported these modems. Public networks, however, may be coming around. **Page 43.**



Averting another airline disaster
At a time when air traffic safety has never been more suspect, air/ground communications in the U.S. is reaching an advanced state of decay. If nothing is done, the danger to air safety can only increase. You can bet your life on that. **Page 31.**

▶ PROFILE

TCA president Prince I. Dyess

He presides over the nation's largest regional communications users group as its recently elected leader.

BY MARGIE SEMILOF
Senior Writer

Joining a communications users group has become one of the most popular ways to weed through and overcome product and regulatory confusion. This trend has been well-illustrated by the expanding membership roster of the West Coast-based Telecommunications Association (TCA).

Originally incorporated in Los Angeles in 1961, TCA has become the largest regional users group of its kind in the country. It began with a core group of eight voice-only managers. In 1969, the growing membership ranks forced the association to decentralize and create state chapters, the most recent addition being the 70-member, Colorado-based section. As the organization enters its 25th year, its membership list is toppling over the 2,200 mark and is increasing at a rate of 15% per year.

The original members formed TCA after learning through casual conversation that they were not all receiving the same information, responses and services from Ma Bell.

The association served as an educational vehicle for any user wanting to compare pricing and services received from the phone company.

The divestiture of AT&T increased somewhat the importance of the users group as an information center.

TCA has actively sponsored seminars and has helped set up university educational programs on issues such as voice and data integration and the possibility of an integrated services digital network.

It also holds an annual conference in San Diego, which was attended by more than 14,000 communicators last year.

Senior Writer Margie Semilof recently met with Prince I. Dyess, who became president of TCA last month.

Dyess is also the director of telecommunications at the Scripps Clinic and Research Foundation, a La Jolla, Calif., medical research institution.

What are some of telecommunications managers' biggest mistakes?
They define the field of telecommunications too narrowly. Telecommunications is a company resource. It is not only a method of moving information. It is a method of doing business. It can create business.

It is much more than an overhead expense, like lighting and heating. Unfortunately, that is where it is too often placed within an organization.

It is important to stay current in your field and not be afraid to take risks. People are often relegated to mediocrity by being afraid to take chances.

You do not have to be an alpha or beta test site, but try some different approaches to the art of moving information. Don't get stuck in the same mode.

Does TCA actually wield any power?
Over the last five years, TCA was represented at every major regulatory action in states where there is a TCA chapter.

The group itself has no power as a law-making body. However, its member companies can be influential because they represent a lot of money spent on telecommunications.

Simply being able to discuss the industry in which we operate is very helpful to members.

It is common within any

PHOTOS BY BOB GRIESER

professional organization that information passing may be helpful or harmful to a particular product or vendor.

Should companies merge their voice departments into their corporate data departments?
It may be desirable to have information coming from a single source within a company. It does help prevent the proliferation of separate systems.

But if telecommunications is properly placed within an organization and there is active dialogue between voice and data departments, there should be no problem leaving them as they exist now. You have to look inside individual company structures. We are not really talking about voice or data. We are passing information, and sometimes it is in digital form.

Does the DP department still rule within a company?
There still seems to be no consistency as to where users are putting voice or data.

It seems to depend on the personality of the corporation and on the individuals that are running both the voice and data networks. Many companies feel that if all information is essentially data, then why not just put it under the data structure? Some companies form a DP position and put all communications under that category.

How would you assess telecommunications users' performance in the postdivestiture environment?
Companies that anticipated divestiture by putting a telecommunications staff in place have benefited. The organizations with a single interface plugged into a utility are the ones that suffer.

I just can't understand why someone would turn over a valuable and expensive telecommunications function to one vendor. From a business standpoint, it just doesn't make sense.

"It is important to stay current in your field and not be afraid to take risks. People are often relegated to mediocrity by being afraid to take chances."

What seems to be the telecommunications user's biggest concern?
Education.

TCA has actively worked to set up telecommunications programs in universities.

Users can become more active within their own professional organization whether it is TCA, [International Communications Association] or [Communications Managers Association].

Those organizations seem to be the initiators of the formal educational mode for telecommunications.

In general, how do your members approach the issue of bypass?
Bypass is nothing more than business as usual.

Close to 100% of large corporations consider bypass as they always have. Companies are just looking out for their own survival, and if it is more economic or feasible to acquire certain services through bypass, then that is what they will do.

Rulings like the recently added access charges put more pressure on companies to look for forms of bypass.

Describe the type of background a telecommunications manager needs to be a success in today's business world.
You have to remember that you are in business, so business acumen is a must.

On the other hand, you can have all the business acumen in the world and still make a bad decision.

Telecommunications directors are becoming more involved in business activities than ever before.

So you must have an overall corporate sense. The manager also needs a strong base in telecommunications theory application, and that knowledge must be kept up-to-date.

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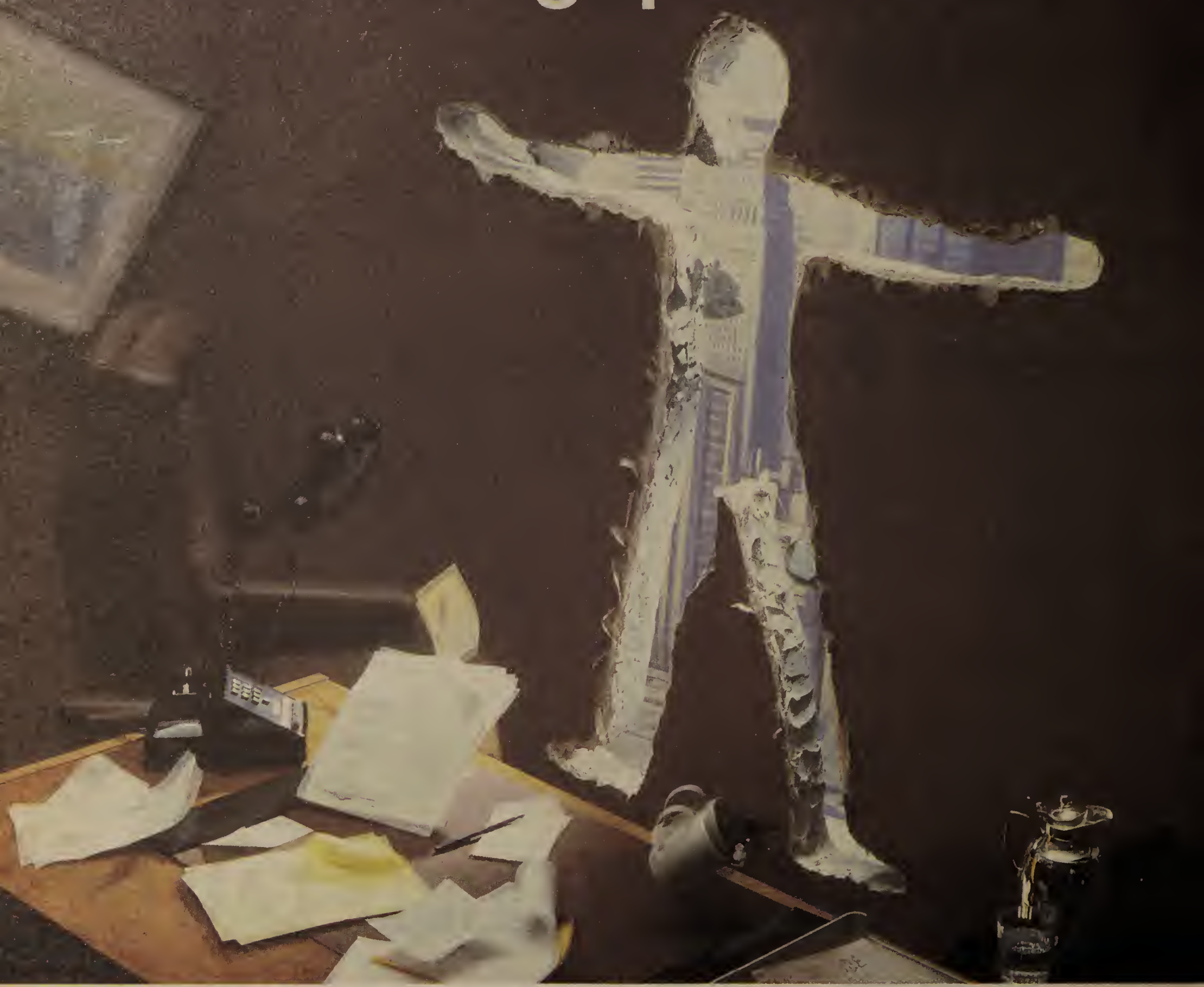

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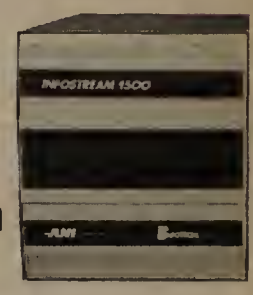
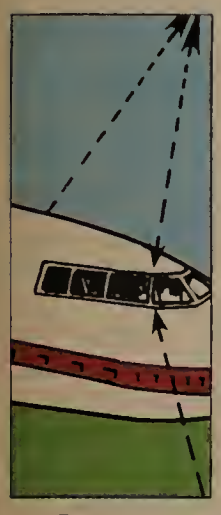


INFOTRON SYSTEMS

▶ CONTINUED FROM PAGE ONE

Averting another airline disaster



links every day. And while no major accidents have been directly attributed to technical communications failures, the current U.S. air/ground communications system is showing its advanced age. In addition, the Federal Aviation Administration's (FAA) ambitious national airspace system modernization program, already behind schedule and running a growing deficit, is further jeopardized by imminent congressional budget-slashing.

"Air/ground communications is the one thing that holds the whole system together," said John Silveira, who is plans, programs and military officer at the FAA air route traffic control center in Nashua, N.H.

"All this other stuff — radar and computers — helps us do our business better and faster, but none of it works unless we can talk to the pilot," he emphasized.

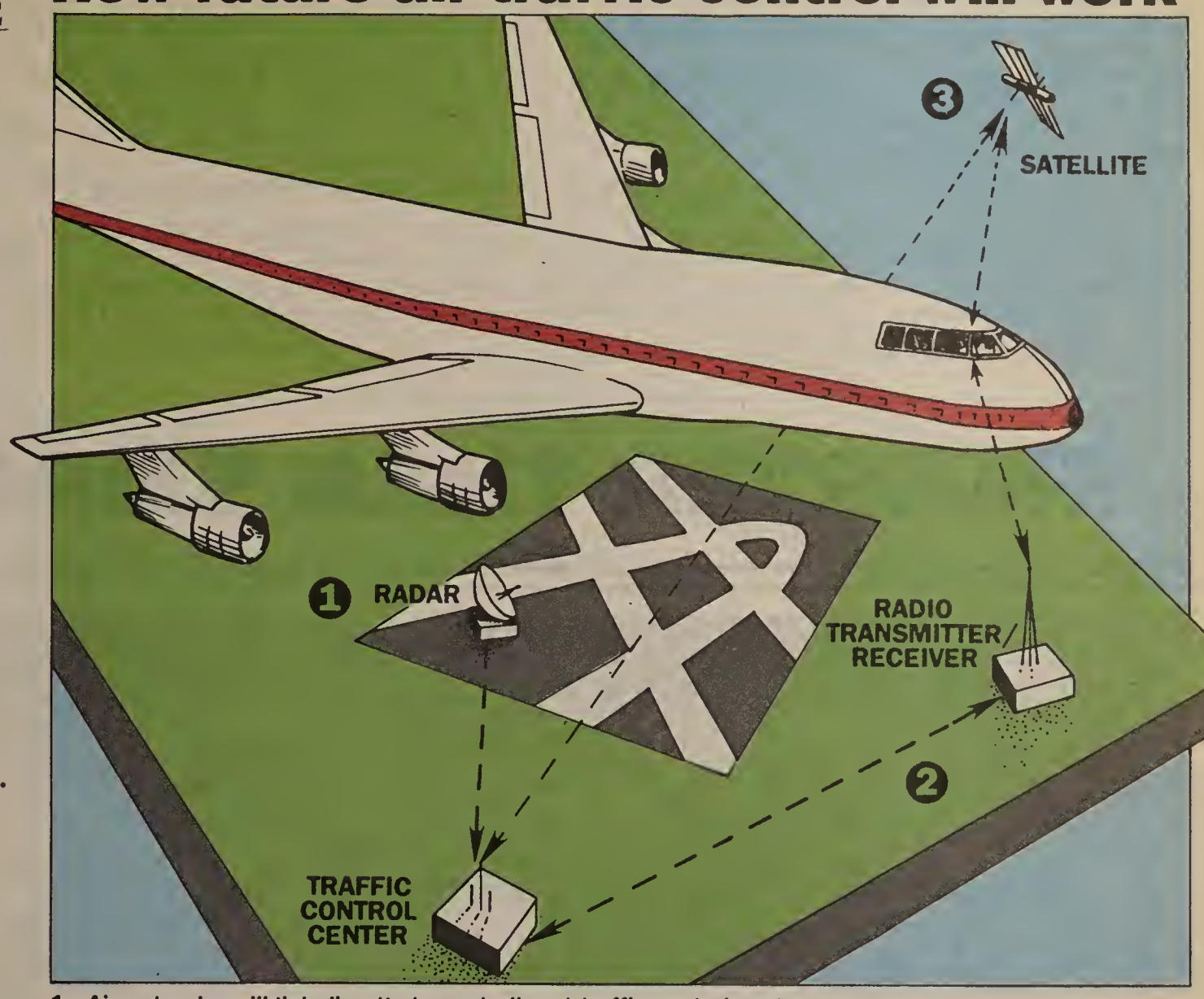
The National Transportation Safety Board (NTSB) has never conducted an inquiry into the safety of air/ground communications systems. All of the limited resources of the NTSB, which according to an NTSB source does not even have a communications specialist on its staff, are eaten up by investigations of what threatens to become an endless chain of crashes.

"We're supposed to be the watchdog of aviation safety, and we are.

"But we are a small agency with only 340 people and a $22-million budget. The FAA loses that much during a coffee break," an NTSB spokesman observed.

The current air traffic control system (see related story on Page 35) has three communications-related shortcomings that spring from the slow modernization of equipment, limited radio spectrum availability and various maintenance problems.

How future air traffic control will work



1. Airport radar will link directly to controller at traffic control center.
2. Minimized voice control communications will use VHF radio and telephone lines.
3. En route, future satellite data link will send flight path and weather data from control center to cockpit computer.

Analog control in a digital world

First and most important, the air traffic control system has not kept pace with technology. Despite the fact that digital, satellite-based links direct to planes were known to be feasible 20 years ago, only U.S. military aircraft now have such capabilities.

Without cockpit data links, FAA frequencies are often congested by time-consuming verbal conversations between pilots and controllers, and as a result, both risk missing crucial communications.

Airline pilots, at first suspicious of cockpit automation, now welcome the data link concept.

"We think it's inevitable that the FAA will have to go to a system that directly transmits communications from a computer on the ground to a computer in the cockpit," said John Mazor, spokesman for the Airline Pilots Association. "I don't know if anybody has thought it through as far as how much voice is going to be left, but obviously the goal is to reduce it as much as you can," he added.

Dependence on voice communications and manual switching of radio frequencies makes handing off an aircraft from controller to controller especially ticklish in bad weather.

Before a plane leaves his sector of airspace, a controller must always ensure that responsibility for that plane has been accepted by the next controller. After the handoff is initiated and accepted via a data link between the two controllers' radar screens, the transferring controller instructs the pilot to switch his radio to the receiving controller's VHF frequency. The pilot then manually switches the radio and is supposed to contact the next controller immediately.

Moments after the crash of Delta Air Lines flight 191 in Dallas last August, the pilot of the American Airlines flight behind it missed a warning from a controller during the handoff procedure.

According to an Associated Press report, a Dallas controller testified to the NTSB that he had warned the American Airlines pilot of a thunderstorm on final approach. But the warning came three seconds after the pilot had switched to another frequency. Luckily, the American Air Lines flight landed safely, but it reported strong wind shear. Use of direct cockpit data links to provide pilots with constantly updated weather information may eliminate such situations.

Within 10 years, the FAA hopes not only to install data links, but to equip controllers with terminals that will display and update information more efficiently. Today, a paper "flight progress strip" with essential flight information is printed for each controller to whom a flight passes. A controller working with 30 such strips, as well as 30

Continued on page 32

> *"'We're supposed to be the watchdog of aviation safety. But we are a small agency with a $22-million budget. The FAA loses that much during a coffee break,' a National Transportation Safety Board spokesman said."*

From **page 31**

radar blips, is considered to be dealing with normal heavy traffic.

It is unclear whether the FAA modernization plan, unveiled in 1982 and dubbed the "brown book process" by FAA staffers, will be completed by the year 2000 as originally hoped.

By the time it is finished, the original $9-billion tab for the project may double.

> *"Because the VHF spectrum available for FAA use is extremely crowded, the agency has moved from single-digit division of frequencies, such as 125.1 MHz, to double- or even triple-digit breakdowns."*

And because the excruciatingly slow bureaucratic procurement and funding process cannot keep up with accelerating technology, the new system may become obsolete before it becomes operational.

The Air Transport Association (ATA), an airline industry lobbying group, recently proposed that the FAA, like the U.S. Postal Service and the Federal Deposit Insurance Corp., be transformed into a federal corporation.

A corporate FAA?

Such a corporation would be free of the usual government constraints on equipment procurement, hiring and promotion of personnel and appropriation of funds.

The ATA argues that a privatized, less bureaucratic FAA would act much more quickly to modernize the air traffic control system.

A question of spectrum

Frequency management problems are another FAA bugaboo. Land mobile satellite communications companies are clamoring to use L-band frequencies (1.5 GHz) allocated to the FAA, but not currently used by the agency.

The FAA wants the Federal Communications Commission to refuse the land mobile applicants so it can use the frequencies for future air mobile services, including satellite-based cockpit data links.

Because the VHF spectrum available for FAA use is extremely crowded, the agency has moved from single-digit division of frequencies, such as 125.1 MHz, to double- or even triple-digit breakdowns, such as 125.175 MHz.

But each new division means that existing radio sets must be replaced or modified, and that is a major expense for the FAA, as well as for airlines and private pilots.

Increasingly, private pilots are being denied permission to land at major airports where their less sophisticated radios cannot tune to the proper frequencies. But few of them can afford to spend more to upgrade radio and navigational equipment that already amounts to nearly 50% of the cost of their planes.

According to Bruce Henry, president of the National Association of Air Traffic Specialists, private pilots are also upset about FAA plans to reduce the number of Flight Service Stations at smaller airports. Approximately 300 stations would be consolidated into about 61 large, automated facilities. Private pilots are especially critical of a new centralized weather briefing system that relies on 800-numbers and prerecorded messages, making it difficult for pilots to get the

Continued on **page 34**

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From **page 32**
individualized service they say they need to deal with quick-changing local weather conditions.

Finally, private pilots fear there will be large areas where a pilot flying a small airplane at low altitude will have no one to call in an emergency.

FAA consolidation plans and budget cuts are also incensing key FAA employees and may ultimately reduce the effectiveness of existing systems.

Air controllers in short supply

It is well known that seasoned air traffic controllers are still in short supply nearly five years after 12,000 of them were fired for participating in an illegal strike.

The FAA has lacked the funds to hire and train enough controllers. Moreover, the airway systems specialists that keep the system running have become a dwindling, discontented breed.

"Historically," said Howard Johannssen, president of the Professional Airways Systems Specialists, "the maintenance and repair of all FAA systems has been done by FAA employees.

"That is being taken over by contractors and mom-and-dad operations around the country," Johannssen added.

"Some have the necessary skills and proper test equipment to do it, others don't."

When a controller cannot communicate with a pilot because of an equipment malfunction, every second of the time it takes to restore communications is critical.

But, Johannssen said, outside contractors based off FAA premises often cannot respond as quickly as in-house personnel. And that is not the only problem with the way the air traffic control system is being maintained now.

"Back in 1978," Johannssen recalled, "we had 11,600 people maintaining all the FAA's systems, including communications, radar and computers, at 19,000 various facilities.

"Because of the stance of the administration and the general cutbacks in government, we've gone down to 7,200 people at 21,000 facilities today," he said.

"What is adding to our concern," he added, "is that there is no one in the pipeline being trained to do what we do."

According to Johannssen, the average air traffic specialist is about 48 years old, and 70% of the people who work in FAA air route traffic control centers, including 50% of those who work in airport towers across the country, will retire in the next five years.

Johannssen noted, "It takes about five years to train our people to the point where they become certifying technicians.

"When a gentleman goes out to check his transmitter or receiver, he's not only saying that it is operating well, but that it is safe to be used in air traffic control.

"If something happens," he continued, "he is individually responsible for it. That takes a high degree of expertise."

In addition to the problems cataloged above, the FAA is at the mercy of careless telephone linemen that disconnect FAA circuits, and hunters that take potshots at phone lines.

Snowmobile ignition systems sometimes interfere with mountaintop transmitters and receivers.

"'Back in 1978,' Johannssen recalled, 'we had 11,600 people maintaining all the FAA's systems, at 19,000 various facilities. Because of the stance of the administration and the general cutbacks in government, we've gone down to 7,200 people at 21,000 facilities today,' he said."

Feeling the effects of divestiture

And divestiture has been no kinder to the FAA than to any other telephone system user. When it needs repairs, moves, adds or changes, the agency must deal with multiple vendors that often waste precious time blaming each other when problems arise.

Although the entire FAA network desperately needs to be brought into the digital age, the agency deserves credit for running its complex communications systems as effectively as it has thus far. As the FAA's Silveira said, "A lot has to go right to make [the air traffic control system] work." Knock on wood.

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▶ANATOMY OF AN AIR/GROUND LINK

"Roger Nashua, exit Boston airspace."

For each commercial airline flight scheduled to fly out of Boston, the airline files a flight plan via direct teletype lines into a computer at the FAA Air Route Traffic Control Center in Nashua, N.H.

Thirty minutes before departure, the Nashua computer sends a message over dedicated phone lines to notify the computer in the tower at Boston's Logan International Airport of the precise time that the flight will be leaving, and what its radar beacon code will be.

At the same time, the Nashua computer sends the proposed departure information, along with the complete flight plan, to the Nashua controller responsible for the first sector, or chunk of airspace, through which the plane will fly once it leaves the vicinity of the airport.

Before takeoff time, the pilot receives taxi instructions from Boston ground control. Ground control turns the pilot over to the tower controller, who grants the plane clearance to fly to Los Angeles at a particular altitude, using the specified radar beacon code. As soon as the plane is airborne, the radar senses its beacon code. The Boston computer sends a message to the Nashua computer notifying it that a particular beacon code was airborne at a particular time.

The Nashua computer, knowing which flight the beacon code is assigned to, keeps track of the plane's progress as it travels from sector to sector within the jurisdiction of the Nashua air route traffic control center. The computer constantly calculates the plane's progress over the ground, based on its speed and altitude, the prevailing winds and other parameters. Depending on the scan rate of the radar, aircraft positions are updated about every four seconds in the airport environment, and about every 15 seconds in the en-route environment.

When a flight from Boston to Los Angeles, for example, approaches the boundary of the Cleveland Air Route Traffic Control Center's territory, the Nashua computer sends all the flight plan and flight progress information to the Cleveland computer, which then distributes the information to its sector controllers at the appropriate times. The same process continues all the way to Los Angeles.

Pilots and controllers communicate over short distances via direct VHF or UHF radio. Over longer distances, communications travel over a combination of radio links and leased telephone lines.

The FAA maintains a large network of remote air/ground transmitter/receiver sites and radar sites that are linked to FAA facilities via analog telephone lines. Flight systems data and radar data are sent over conditioned lines, while controller-to-pilot communications travel over voice-grade lines.

> *"If a computer and its backup go down and no flight plan is available, controllers follow FAA procedures for manually writing flight plans and communicating them over the phone."*

Even though the radar sources are digital, the data is converted to analog form for transmission over the phone lines, then reconverted to digital format before being fed into the receiving computers.

A complex system of backup computers, switches and transmitters comes into operation in the event of an equipment failure. If a radar installation goes completely down, controllers apply nonradar aircraft separation procedures. If a computer and its backup go down and no flight plan is available, controllers follow FAA procedures for manually writing up flight plans and communicating them over the phone to the next controller.

Most FAA radar, data and voice communications depend on phone lines. According to FAA employees at Nashua, the FAA gets preferential repair service, but otherwise, is treated as just another phone company customer.

— Steve Moore

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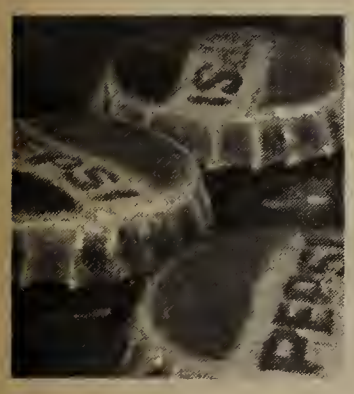


BY MICHAEL HURWICZ AND JERRY HARDER
Special to Network World

Pepsico, Inc. is now using Isacomm's Virtual Private Network (VPN) to service its locations in and around Chicago. The virtual private network, or software-defined network, wherein a carrier such as Isacomm provides

ILLUSTRATION BY KEN CONDON

a customer with services equivalent to those provided by a private electronic tandem network, is a relatively new offering, and many users are still in a wait-and-see posture toward it. The main advantage of a virtual private network is that the customer does not have to purchase or manage the tandem switches and dedicated circuits that are the main elements of a traditional private network.

Two major questions commonly asked about virtual private networks are why and how customers might migrate to them from a traditional network. Consider, for example, a case in which the virtual network would have a lower monthly cost than the traditional network. Even then, a business would be unlikely to dismantle the tried-and-true traditional network to plunge headlong into the unknown virtual private network.

> *"The virtual private network, or software-defined network, is a relatively new offering, and many users are still in a wait-and-see posture toward it."*

For this reason, virtual private network vendors have provided means of installing their networks a node at a time, and of interfacing with the existing electronic tandem network. This has also resulted in a large measure of flexibility, since a customer can design a hybrid network in which some locations are serviced by traditional tandem switches and dedicated circuits, and others by a virtual private network. Pepsico is taking advantage of this flexibility both to solve an immediate problem and to begin an extended evaluation of virtual private network service.

The immediate problem addressed by the VPN resulted from Pepsico's divestiture of Wilson Sporting Goods Manufacturing Co., which is headquartered in Chicago. Wilson's premises housed the tandem switch that served Pepsico's locations in and around Chicago. By divesting Wilson, Pepsico lost its Chicago switch. Nevertheless, Pepsico continued to have a significant amount of traffic in the Chicago area.

In the past, Pepsico had "tail ended" most of this traffic. That is, it routed the traffic over the private network to the Chicago switch and completed it via Feature Group A — a type of line-side access to an associated switch — or intrastate Wats.

This turned out to be significantly less expensive than completing the traffic via interstate Wats from the originating network switch.

In order to continue doing this, however, it was necessary to have a switch located in Chicago. It became obvious that Chicago was a desirable hub for the Pepsico network, even though Pepsico no longer had large locations there.

Given this situation, Pepsico explored four major options:

First, buy a new switch and install it in one of Pepsico's locations in the Chicago area. There were a number of possible locations, including a Frito-Lay, Inc. office and a Pepsico office.

The type of ETN switch needed to service the Chicago area would, however, have represented tremendous overkill as a private branch exchange for any of these locations, both in terms of size and features. A management decision had been made to maintain a single vendor environment for switching equipment, which limited the choice of switches. In an office housing perhaps 20 or 30 people, Pepsico, in order to get the network switching capabilities it needed while maintaining this environment, would have been installing a switch capable of serving thousands of stations. The result would have been a cost per person for PBX services at that installation of between $900 and $1,100 per month, a figure very difficult to justify.

Other hard questions included those concerning the capital outlay for the switch and the question of delivery dates on the switches being considered. AT&T Information Systems' System 85, for example, could not have been delivered for at least six months from the day it was ordered, and Wilson was due to be divested and off the network sooner than that. These considerations made the purchase of a switch relatively unattractive.

A second possibility was to share a switch with another company. This possibility was explored seriously, and discussions were started with a large manufacturing company based in Connecticut. From a technical standpoint, the project seemed quite feasible.

However, before the two companies got to the point of discussing pricing, various questions were raised by their legal departments. Answering these questions promised to take some time, perhaps more than was available. In addition, there were some questions about security. Again, time was an important factor, and Pepsico's telecommunications people decided to consider this solution as a fall-back, but to continue exploring other alternatives.

The third possibility was to lease ports on a carrier's switch on a monthly basis. Pepsico

☞ Continued on **page 38**

From **page 37**

would have terminated private lines from its locations on the carrier's switch, and the carrier would have partitioned the switch so that Pepsico could have exclusive use of part of it.

Functionally, it would have looked as if Pepsico had its own switch there. The main difference between this and a virtual private network service would have been the way it was tariffed.

Pepsico explained its requirements to one carrier, which came back with a cost in excess of fifty cents per minute. (Current network costs are somewhere between 28 cents and 30 cents a minute.) Further discussion got that price down to about 40 cents per minute, which was still somewhat more than Pepsico was willing to pay. In addition, of course, this solution was entirely unproven.

■ The fourth alternative was to consider some type of software-defined or virtual private network. First, Pepsico looked at AT&T's Software Defined Network offering. The major problem with this offering was that it would not be available soon enough to solve Pepsico's urgent problem. There were some questions about pricing, too.

The monthly cost did not look lower than the traditional network cost, and there was a start-up fee of more than $100,000.

However, in view of Wilson's having to be off the network so quickly, the money issues were never explored in detail.

An alternative private network offering Pepsico was considering was Isacomm's VPN. It was considered because Isacomm's had no large start-up fee and was available immediately.

As Mike Bitterman, director of telecommunications for Pepsico, said, "We met with U.S. Telecom [Isacomm's parent company] a number of times.

"My staff had a number of very heavy meetings with them to get reassurances about the availability of the service, the quality of the service, the pricing and so on," he said.

"And we became convinced that this was probably the best alternative, certainly in the short-term and on a non-capital-intensive basis. So we made the decision to go ahead and began the job of determining how we were going to do it technically and what the time frames were," he added.

Formerly five nodes

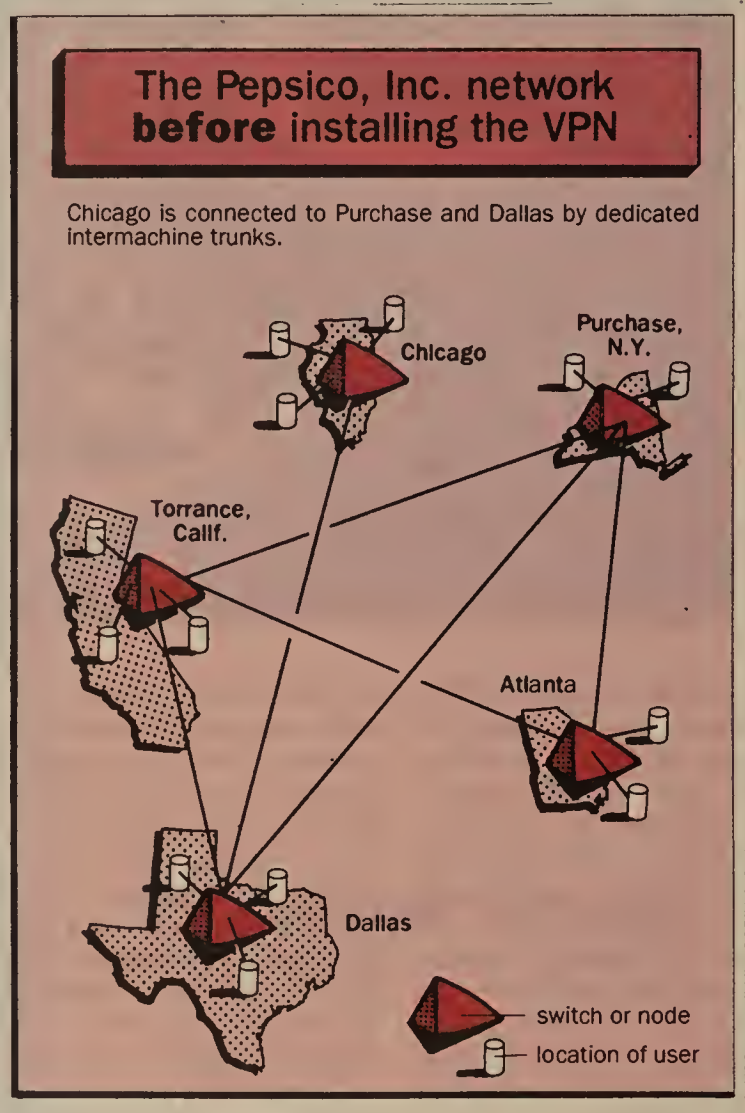
Prior to installing the VPN, Pepsico had five nodes on the private network: Wilson Sporting Goods headquarters in Chicago; Frito-Lay headquarters in Dallas; a Pepsico bottling facility in Torrance, Calif.; a Pizza Hut, Inc. office in Atlanta; and at the Purchase, N.Y. headquarters of Pepsico. The Chicago node was connected by intermachine trunks to those in both Purchase and Dallas. (See Figure 1 below.)

After the VPN was installed, the Chicago-to-Dallas and the Chicago-to-Purchase intermachine trunks were disconnected.

The locations that had been homed, or connected by access lines, to the Chicago switch were now homed to the nearest Isacomm VPN node.

VPN service also had to be installed at the Dallas node. Such installation at the Purchase node was also necessary.

The remainder of the private network architecture remained unchanged. (See Figure 2 below.)



SOURCE: TELCO RESEARCH CORP.

> *"Network costs should decrease, assuming more locations are added to the network, because virtual network vendors offer quantity discounts."*

ETN and VPN cost trade-offs

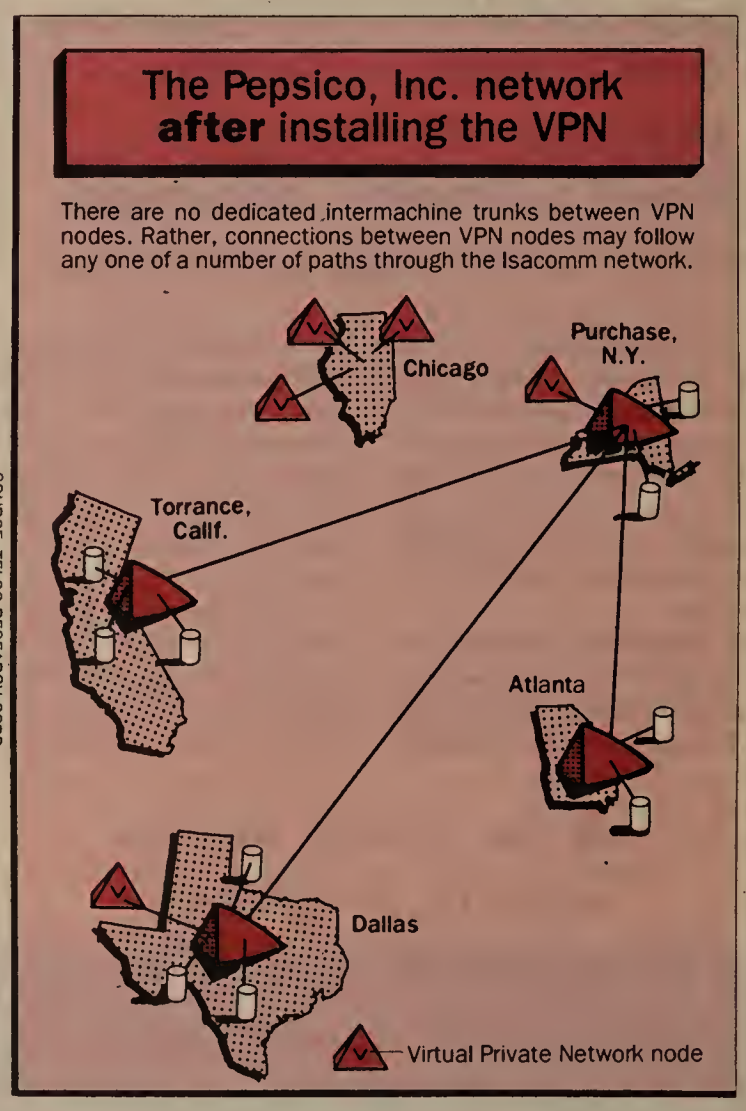
VPN traffic was now also possible from Dallas to Purchase, so cost trade-offs between the ETN and the VPN were examined and those intermachine trunks were resized accordingly.

The main problems associated with the installation resulted from the fact that a System 85 was installed at the Dallas node at the same time the VPN service was installed. Isacomm had not previously operated VPN on a System 85, so there were some technical problems.

> *"Pepsico found that getting AT&T Information Systems and Isacomm to cooperate in solving problems was not easy."*

Pepsico found that getting AT&T Information Systems and Isacomm to cooperate in solving these problems was not always easy. The lack of cooperation occurred at the level of the technicians working on the problems rather than at the level of the account executives or upper management.

Speaking of the upper management at Isacomm, Bitterman said, "They are a very dedicated group. They know what they are doing technically. To say that they are trying hard is an understatement." Transmission quality seems to have been good, so far.



Three-phase network evaluation

Now that the immediate problem of keeping Chicago on the network has been solved, Pepsico will continue to evaluate virtual network services. The company sees three phases to this evaluation.

■ The first phase involves looking at the locations that are on the network today and determining whether they could be served more economically by a virtual network.

■ The second phase involves certain locations that are too far from one of the five nodes to have been included in the network in the past, but which management would very much like to have on the network.

One of the advantages of the virtual network is that the access circuit group runs only to the nearest carrier node. Since carriers have many more nodes than customers have, access costs are usually reduced.

Therefore, locations that could not be included in a traditional private network for economic reasons may be economically justifiable in a virtual network.

■ The third phase involves looking at all Pepsico locations over a certain size. The principle here is exactly the same as in phase two: Virtual network costs will be compared with the present cost of completing the traffic by Wats or Wats-like services, or by direct distance dialing or other means, and where the virtual network costs less, it will be installed.

Phase three may change the network dramatically, perhaps doubling or tripling the number of locations on the network. (There are about 70 locations on the network today.)

This would likely have significant effects on network management, control and staffing. Thus, a great deal of study may be required before recommended changes are implemented. Nevertheless, this phase may be completed some time during 1986.

As the phases are completed, network costs should continue to decrease, assuming more locations are added to the network, because virtual network vendors offer quantity discounts: The more traffic you complete over the virtual network, the less each minute of traffic costs, due to the tariff structure. Bitterman explained that there are a number of reasons for handling the evaluation in stages.

One is that staff to manage the

Continued on **page 42**

A. Jones. *Patrick Henry Delivering His Speech at the House of Burgesses*. Courtesy The Bettmann Archive.

There's no argument that in today's business arena, 2400bps full duplex dial modems provide the lowest cost and fastest route to data communications. But of all the modem manufacturers that are promising you great dial line savings, there's only one company delivering the modem products you really need – Concord Data.

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> *"Because the analysis effort is so critical to the success of the project, the ability of vendors to support this effort will be an important element."*

From **page 38**

process is limited, and the task of performing the evaluations and implementing the changes is a significant one.

In addition, as time goes on, there should be a greater diversity of virtual network offerings, and by waiting, Pepsico may be able to position itself to take advantage of that diversity.

In particular, Pepsico would like to take a closer look at the AT&T Software Defined Network offering. MCI Communications Corp. has also announced a virtual network offering called Prism, formerly known as V-Net.

In performing these analyses, Pepsico will use information from vendors, its own in-house expertise and software optimization tools from third parties.

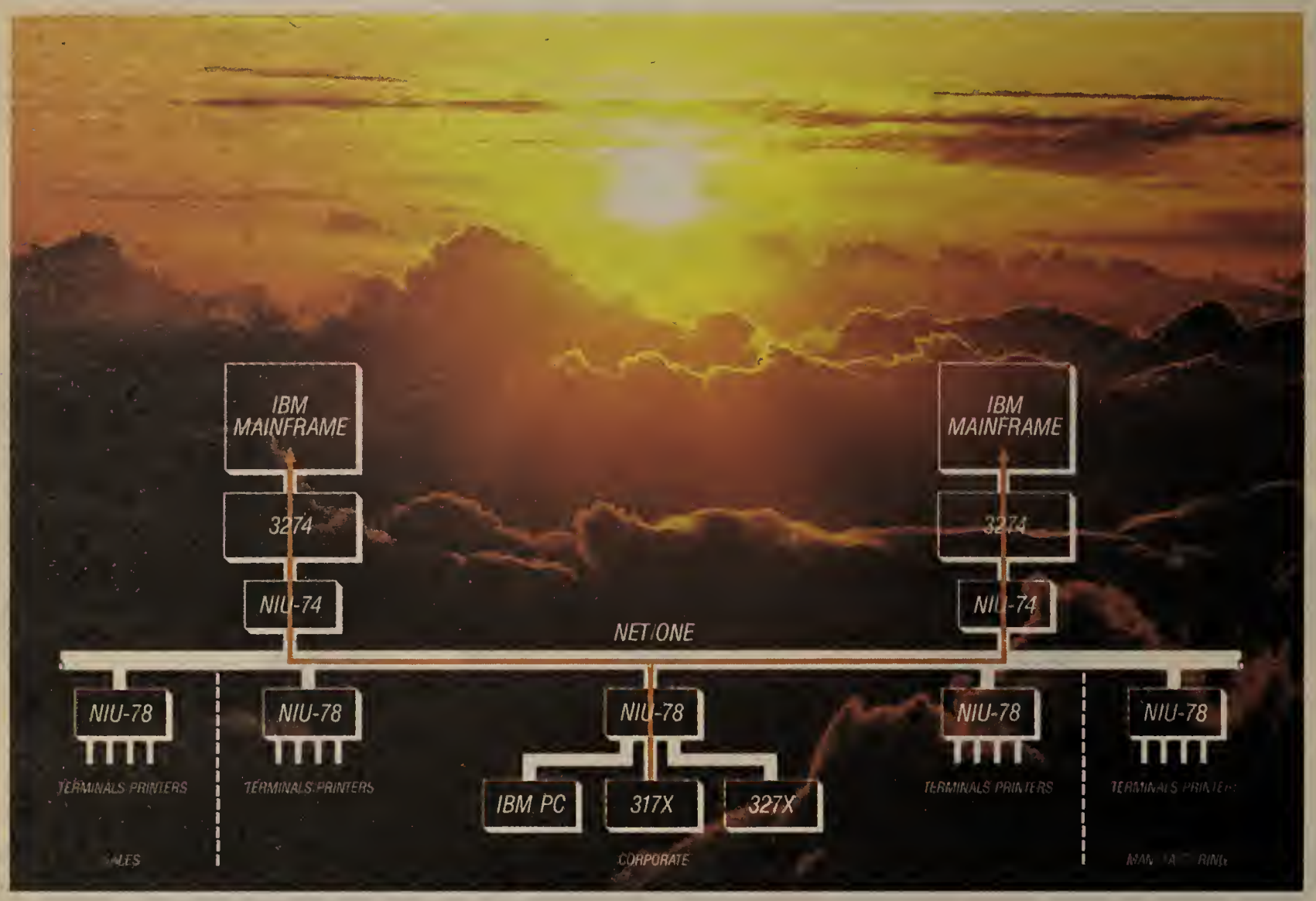
Because the analysis effort is so critical to the success of the project, the ability of vendors to support this effort will be an important element in determining to which service or services Pepsico will subscribe.

One of the issues here is how well vendors understand private networks from the customer's point of view.

As Bitterman said, "Having come from AT&T myself, I can tell you that the way you view a network from this end of the world is considerably different from the way you view it from the carrier's side."

Bitterman refused to speculate on the long-term viability of the traditional tandem network.

"For anyone to say that ETNs are dead is pure conjecture. We are doing things pretty much on a short-term planning cycle. The furthest we'll look out is three years, and even that is starting to take some really long-term guesses," he said.



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▶ 2,400 BIT/SEC MODEMS

Bigger, Faster, Better?

The market was supposed to boom. Instead it's crawling to survive.

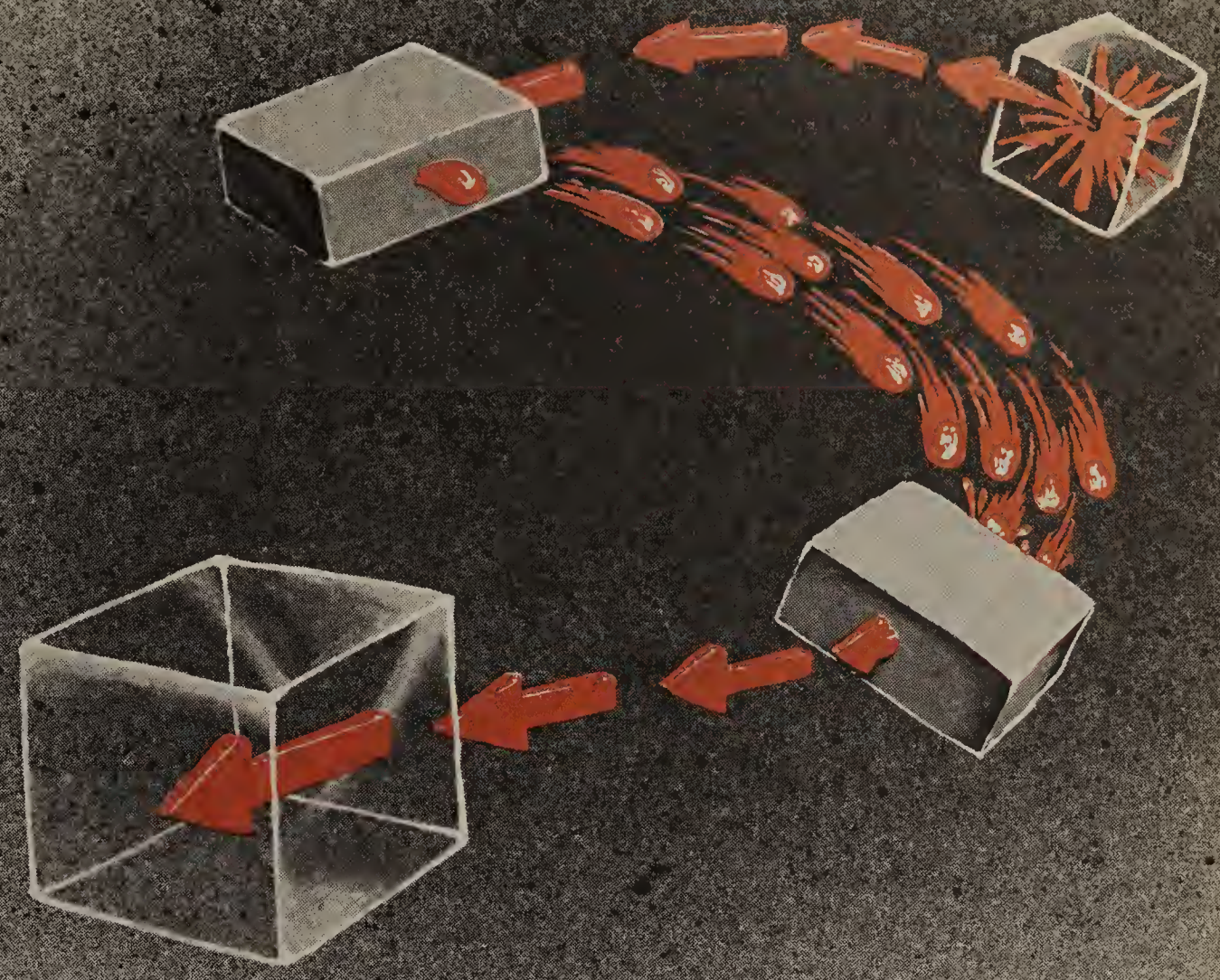

ILLUSTRATION BY TOM BARRETT

BY BOB WALLACE
Senior Writer

There's good news, and there's bad news in the 2,400 bit/sec full-duplex modem mart.

The good news for users is the cost of these data communications network staples has been plummeting for close to a year now. The bad news is modem vendors in this marketplace are encountering difficulty establishing an installed base of 2,400 bit/sec devices.

To complicate matters for prospective users, the lack of an international standard for error-checking protocols has touched off a battle between the two preeminent error-checking schemes — with each trying to stamp out the other.

Dial-up 2,400 bit/sec modems are generally used to allow personal computer and terminal users to tie into processing resources via regular local telephone company lines.

These devices also help communications users gain access to public data base services such as Readers Digest's The Source or Dow Jones & Company, Inc.'s Dow Jones News Retrieval Service.

> *"The lack of an international standard for error-checking protocols has touched off a battle between the two preeminent error-checking schemes."*

Oftentimes, users hook up with processing resources on corporate communications networks using the packet-switched, value-added network facilities provided by Tymnet/McDonnell Douglas Network Systems, Inc., GTE Telenet Communications Corp., U.S. Telecom Data Communications Co. and others.

A catch-22 of development

The development of the 2,400 bit/sec full-duplex modem market has been trapped in a classic catch-22 predicament. Several modem vendors claim value-added network vendors are not implementing these units in their networks in large enough numbers, hence limiting demand for the modems.

Value-added network vendors counter that the demand for 2,400 bit/sec modems is not strong enough among users to justify increasing their numbers in the networks.

Steve Y.R. Kim, X.PC specialist with Tymnet, is familiar with the use of 2,400 bit/sec modems in value-added networks. His comments explain the frustrating situation in which modem vendors have found themselves.

"The deployment of these modems is based on market demand," Kim said.

"No matter how many 2,400 bit/sec modems we allow network access through, there aren't enough out there to justify their cost or deployment," he added.

Kim Maxwell, president of Racal-Vadic, Inc., Milpitas, Calif., said the value-added network vendors were partially to blame for the slow development of this modem mart.

"Developments in this industry have been largely negative," Maxwell explained.

"The [value-added networks] have not moved to support 2,400 bit/sec modems as fast as they claimed they would or as fast as everybody thought they would."

Mark Lovington, medium-speed modem manager for Concord Data Systems, Inc., and Don Viecelli, modem transmission group program manager for Gandalf, Inc., both said there is truth in Maxwell's words.

Maxwell's claim appears to hold weight. GTE Telenet, Tymnet and Uninet, the big three value-added network vendors, accounted for a whopping 85.5% of the packet network market in 1984, according to a study released by Link Resources Corp. in New York.

GTE Telenet spokeswoman Claudia Houston said roughly 60 of GTE Telenet's 300 central offices, or 20%, are equipped with 2,400 bit/sec modems. "We plan to expand their usage as demand increases," she remarked.

Tymnet spokesman Bill Erysian said only 80, or 13%, of the roughly 600 cities Tymnet serves are equipped with 2,400 bit/sec modems.

Speeding deployment

Unlike its competitors, Uninet has embarked on a program designed to speed the deployment of these modems in its network. Bill Combs, marketing vice-president for Uninet, claimed the net, which can be accessed from 510 cities, features access via 2,400 bit/sec modems in 215 of these locations.

Combs said Uninet plans to have all the cities it serves accessible via 2,400 bit/sec modems by the end of this year.

A study produced by International Data Corp., a Framingham, Mass.-based market research firm, said the 2,400 full-duplex modem marketplace was worth $92 million in 1984.

The report predicted the dollar value of the same market would swell to $203 million by year end. The study predicted only a 42% jump in the total number of units shipped.

Plummeting prices

Although modem vendors are not satisfied with the number of 2,400 bit/sec modems in value-added networks, they concur that the plummeting price of these units will touch off a wave of frenzied modem purchasing.

"Prices on these modems have come screaming down over the last nine months," Maxwell explained.

"You couldn't find a 2,400 bit/sec modem a year ago for less than $900." He predicted the cost of these units, which he said has dropped 35% to 40%, will stabilize. Maxwell forcasted an average cost of $500 to $600 per modem for the

☞ Continued on **page 46**

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Company	Product	Compatible With:	Command Sets Supported	Built-In Error Correction	Built-In Nonvolatile Memory	Built-In Automatic Log-On Feature	Alternate Number Redial	Data Compression Capability	Vendor-Supplied Software Available	List Price Stand-Alone	List Price Rack-Mounted
AT&T Information Systems Morristown, N.J.	Model 4024	Bell 103, 212A; V.22, V.22bis	Hayes AT, AT&T		19 sequences of 36 digits		✓		AT&T Softcall Version 2.0	$750	
	Model 2224E	Bell 103, 212A; V.22, V.22bis	AT&T		4 sequences of 36 digits				AT&T Softcall Version 2.0		$1,265
Case Communications, Inc. Silver Spring, Md.	Case 1224	Bell 103, 108 212A	Hayes AT, Case Enhanced	Microcom Networking Protocol Class 2	60 digits	✓	✓		Microstuf, Inc. Crosstalk Version 16	$649	$644
Cermetek Microelectronics, Inc. Sunnyvale, Calif.	Cermetek 2400 Modem	Bell 103, 212A; V.22, V.22bis	Hayes AT		40 digits				Microstuf, Inc. Crosstalk Version 3.6	$745	
	Cermetek 2400 EP Modem	Bell 103, 212A; V.22, V.22bis	Hayes AT	Microcom Networking Protocol Class 3	40 digits				Microstuf, Inc. Crosstalk Version 3.6	$795	
Codex Corp. Mansfield, Mass.	Codex Model 2233	Bell 103, 212A; V.22, V.22bis	Hayes AT, Codex Verbose, Codex Terse		9 sequences of 40 digits		✓			less than $500	
	Codex Model 2238	Bell 103, 212A; V.22, V.22bis	Hayes AT, Codex Verbose, Codex Terse		9 sequences of 40 digits		✓				$800
Concord Data Systems, Inc. Waltham, Mass.	CDS 224 Series II Modem	Bell 103, 212A; V.22, V.22bis	Hayes AT, Concord		10 sequences of 80 digits					$695	$645
	CDS 224 PC Modem	Bell 103, 212A; V.22, V.22bis	Hayes AT, Concord		10 sequences of 80 digits						$695*
Gandalf Data, Inc. Wheeling, Ill.	Access Series 24S	Bell 103, 212A, 113; V.22, V.22bis	Hayes AT, Gandalf		10 sequences of 40 digits	✓	✓		Gandalf Link 2000	$650	$595
Hayes Microcomputer Products, Inc. Atlanta, Ga.	Smartmodem 2400	Bell 103, 212A; V.22, V.22bis	Hayes Expanded		40 digits				9 versions of Hayes Smartcom available	$899	
	Smartmodem 2400B	Bell 103, 212A; V.22, V.22bis	Hayes Expanded		40 digits				9 versions of Hayes Smartcom available		$739*
Micom Systems, Inc. Chatsworth, Calif.	Model 3024+	Bell 212; V.22bis	Micom Terminal Control Modem		55-60 digits dynamically allocated	✓	✓			$685	
	Model 3224+	Bell 212; V.22bis	Micom Terminal Control Modem		55-60 digits dynamically allocated	✓	✓				$660
Microcom, Inc. Norwood, Mass.	AX/2400	Bell 103, 212A; V.22 V.22bis	Hayes AT, Microcom SX	Microcom Networking Protocol Class 4	9 sequences of 36 digits		✓		Microstuf Inc. Crosstalk Version 16, Microcom ERA II	$749	$729
	AX/2400c	Bell 103, 212A; V.22 V.22bis	Hayes AT, Microcom, SX	Microcom Networking Protocol Class 5	9 sequences of 36 digits		✓	✓	Microstuf, Inc. Crosstalk Version 16, Microcom ERA II	$899	$879
Racal-Vadic, Inc. Milpitas, Calif.	2400 PA-S	Bell 103, 212A; V.22, V.22bis	Hayes AT2, Racal-Vadic	Microcom Networking Protocol Class 2 & 3	15 sequences of 60 digits	✓	✓		Racal-Vadic George, MacGeorge	$795	$595
	Maxwell Modem 2400V	Bell 103, 212A; V.22bis	Hayes AT2, Racal-Vadic		uses personal computer memory		✓		Racal-Vadic George, MacGeorge	$595	

This chart represents a selection of vendors leading the 2,400 bit/sec modem market. Many of the vendors listed here manufacture additional products as well.
* personal computer card unit

From **page 43**

next six to nine months.

Gandalf's Viecelli said the glory days of the 2,400 bit/sec modems may be just around the corner. "If prices ever hit $500 to $550 a unit on the average, you will witness a massive switch to the higher speed modems, because they are more economical and have better error rates."

The battle of the network protocols has raged on for close to two years with neither error-checking protocol emerging as an industry or international standard. (See related story on page 53.)

X.PC vs. MNP

The two predominant schemes are X.PC, a public domain error-checking scheme strongly supported by Tymnet, and Microcom, Inc.'s Microcom Networking Protocol (MNP), a proprietary error-checking system that carries a licensing fee. These protocols attempt to eliminate errors in modem-to-modem transmission over dial lines by requesting acknowledgments of correct data received or requests for retransmission of flawed data.

Vendor talk, but little action

Although several modem vendors have announced support of one of the two methods, few companies have implemented either of the two protocols in their 2.400 bit/sec products.

Some, such as Cermetek Microelectronics, Inc., Racal-Vadic and Microcom, offer MNP as standard equipment with some of their units, while other vendors, like Concord Data Systems, offer MNP as an optional feature.

Continued on **page 51**

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Gandalf's COAX 3270 allows IBM 3270 terminals to access both IBM mainframes and asynchronous computing resources using simple keyboard commands. It enables your IBM terminal to emulate an ASCII terminal!

The COAX 3270 can handle data rates up to 19,200 bps with full scrolling capability and optional printer output support. It may be located with the terminal or with the 3274 controller. Configuration is via a user-friendly menu where pre-set or custom emulation can be selected.

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Digital T-1 Networking

Gandalf's GLM528 is the only high speed data-only T-1 multiplexer with synchronous and asynchronous data handling capabilities. As such, it provides a very cost-effective means of networking a large cluster of terminals, PC's, multiplexers or other synchronous devices directly to a host or to a PACX data switching mode.

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PC Networking

Gandalf's LINK 2000 gives you the opportunity to give your IBM PC or IBM compatible running MS-DOS the power of a LAN. You'll benefit from resource sharing, efficient file transfers, terminal emulation capability and easy access to local and remote databases. All you need is a 128K PC memory, an asynchronous communications adapter with cable, and $195 for the 5¼ inch LINK 2000 floppy disk kit. You'll also need a Gandalf data switching product such as SWITCHMUX or PACX® to gain access to multiple resources.

One of the most powerful PC communications software packages available, LINK 2000 gives you XMODEM and KERMIT protocol support for enhanced, error-free file transfers. It supports such automatic functions as auto dial, auto answer and automatic call-up, log-in and entry of commands to a remote computer. And it gives you 40 user-defined function key procedures per command file.

When packaged with Gandalf's new ACCESS Series 24S dial modem, LINK 2000 allows you to send and receive data error-free at 2400 bps on standard telephone lines. And you'll be able to communicate asynchronously or synchronously with other CCITT V.22 bis, Bell 212 or Bell 103 modems. For a package price of just $775, you'll benefit from one of the smallest, smartest LSI-based modem communications kits available. The ACCESS Series 24S has autobaud, auto dial, and auto answer capabilities. Other modem features include: Hayes command compatibility or Gandalf friendly mode, multiple number redial and alternate number dial, auto log-on and much more. For further details, contact Gandalf Sales at 1020 S. Noel Ave., Wheeling, IL 60090 Tel: (312)541-6060.

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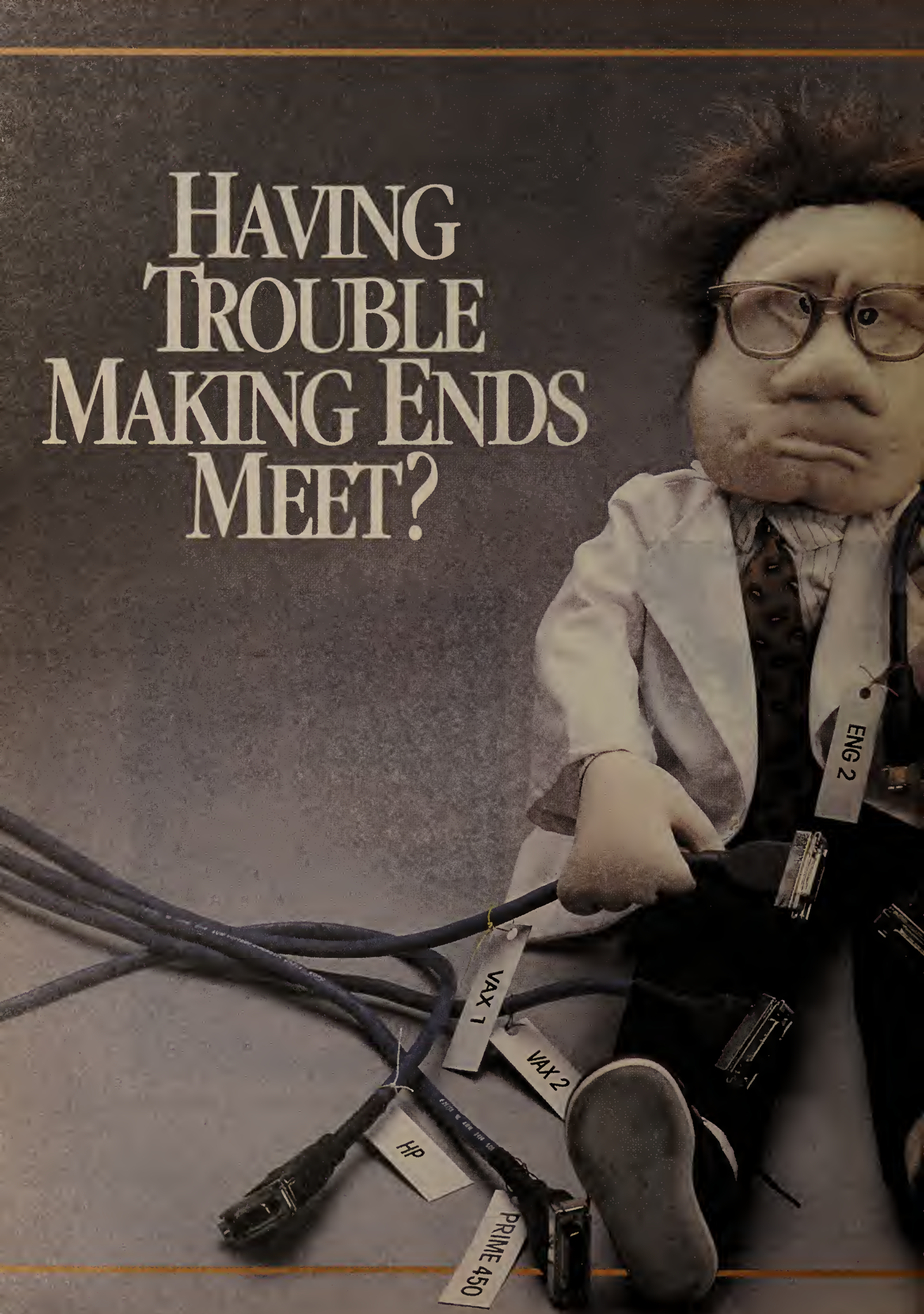

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*McGraw Hill's "Data Communications" magazine rated us as having the best technology and price performance.

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From **page 46**

Concord Data Systems also offers ARQ, a proprietary error-checking scheme. Regardless of which protocol they are claiming to support, almost half of the 2,400 bit/sec modem vendors offer no error-checking capabilities at all.

All of the modems listed on the chart on Page 46 offer such features as adaptive equalization, local and remote diagnostics and built-in tandem dialing support.

Maximizing throughput

Adaptive equalization is a technique employed by modems in situations where the quality of dial lines is poor or when data is being transmitted over long distances.

This method of maximizing throughput where noise distortion is present requires the modems on a line to adjust dynamically to the characteristics of a dial line at each end. All modems listed also perform several local and remote diagnostic tests. Tests supported include local analog loop, local digital loop and remote digital loop.

These modems also perform self tests that are designed to test the unit itself, as opposed to the communications channel.

In an analog loop, test data sent by the modem is looped back to the terminal or computer instead of to the phone line. The procedure tests the modem's analog circuits.

In a digital loop test, however, the data received from the remote modem is then sent back to that modem. A remote digital loop test routes data sent from a local modem through the remote modem and back to the local unit.

A modem equipped with built-in tandem dialing support can dial nine to reach the company's private branch exchange and then wait for a second dial tone to capture a remote line.

The large majority of the modems listed on the chart on Page 46 have the ability to support synchronous data input. Simply stated, this means that the 2,400 bit/sec modem can support the timed transmission of data. Timing is provided by clocks that are encoded for transmission for the data.

Remote site log on

The automatic log-on capability allows the user to log on to the computer or data base at a remote site by pressing a single key on the personal computer. This action sends a block of information to the remote modem, which passes it along to the processing resource. This capability may also be set up using modem software.

All units listed comply with standards, either de facto or official international, that govern the transmission of data at certain speeds. V.22bis is a Consultative Committee on International Telephony and Telegraphy recommendation for data transmission at 2,400 bit/sec. Bell 212A is an industry standard transmission protocol, backed by all U.S. modem vendors, that supports data transmission at 1,200 bit/sec. Bell 103 is an industry standard for the sending of data at 300 bit/sec.

Command sets are used to help establish primary communications operating parameters.

Most units support Hayes AT

With the exception of Micom Systems, Inc.'s Model 3024+ and Model 3224+, all modems listed support at least one version of the popular Hayes Microcomputer Products, Inc. AT command set. Most modems also support a proprietary command set in addition to the Hayes Microcomputer Products scheme.

The amount of built-in, nonvolatile memory varies among modems. The Racal-Vadic Maxwell Modem 2400V is the only unit listed that uses the personal computer's memory to store frequently dialed telephone numbers. Cermetek Microelectronics' Cermetek 2400 and Cermetek 2400EP can store a total of 40 digits, while Concord Data Systems' CDS 224 Series II and its CDS 224 PC Modem are capable of storing a total of 800 digits (10 sequences of 80 digits each).

> *"In an analog loop, test data sent by the modem is looped back to the terminal or computer. In a digital loop test, however, the data received from the remote modem is then sent back to that modem."*

A 2,400 bit/sec modem equipped with alternate number redial, or link number, capabilities can eliminate excessive dialing by the user. If the modem dials a telephone number that is busy, it will automatically dial the next number

Continued on **page 52**

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▶ ERROR-CHECKING PROTOCOLS

MNP vs. X.PC: Will either triumph?

The tide may well have turned in the battle of the network protocols.

Microcom, Inc., a Norwood, Mass.-based modem manufacturer and developer of the Microcom Networking Protocol (MNP), recently released Classes 1, 2 and 3 of the six-level asynchronous error-checking protocol to the public domain. This means that modem vendors wishing to incorporate this protocol into their modem software need only shell out $100 for the necessary documentation. Prior to Microcom's action, a license for MNP cost $2,500.

Microcom spokesman Doug Landfield claimed this effort was designed to shift MNP from a de facto standard to an official standard. "The protocol will now be available to anybody."

The other communications combatant in this struggle is Tymnet/McDonnell Douglas Network Systems, Inc., the number two value-added network operator, according to a recent study produced by the Framingham, Mass.-based International Data Corp.

The X.PC error-checking scheme, which is strongly backed by Tymnet, has been in the public domain for some time.

Several modem vendors and value-added network operators have thrown their support behind one of the two error-checking methods, but few modem vendors actually implement either asynchronous approach in their products.

MNP, on the other hand, is being offered as a standard feature on 2,400 bit/sec units produced by Case Communications, Inc., Cermetek Microelectronics, Inc., Racal-Vadic, Inc. and Microcom. MNP Class 5 offers modem users a novel data compression feature. MNP Classes 4, 5 and 6 will remain proprietary and will carry the $2,500 license fee.

Hayes Microcomputer Products, Inc., Racal-Vadic and Prentice Corp. have announced support of X.PC, but do not offer X.PC support in their modems. Steve Y.R. Kim, X.PC specialist with Tymnet, claimed these companies are in the process of implementing the protocol in their products.

Kim added that software producers Microstuf, Inc. and Microsoft Corp. and interexchange carrier MCI Communications Corp. are also in the implementation stage. Aside from Tymnet, Concord Data Systems, Inc. appears to be the only company offering X.PC to prospective 2,400 bit/sec modem buyers. Concord Data Systems offers both X.PC and MNP as optional features on its units.

Several vendors are playing the waiting game in this situation, opting to wait until one of the two error-checking methods becomes a standard. This may not happen for some time, as those responsible for approving such a standard are unsure there is adequate user demand.

Jim Kinnard, chairman of the American National Standards Institute's X3S3.4 technical task group, said the issue of error-checking protocols is under study within his group. "We are not doing a formal study," Kinnard cautioned. "We are looking at whether such a protocol is needed. There seems to be some demand for it."

— Bob Wallace

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stored in its memory, continuing this process until a connection is made.

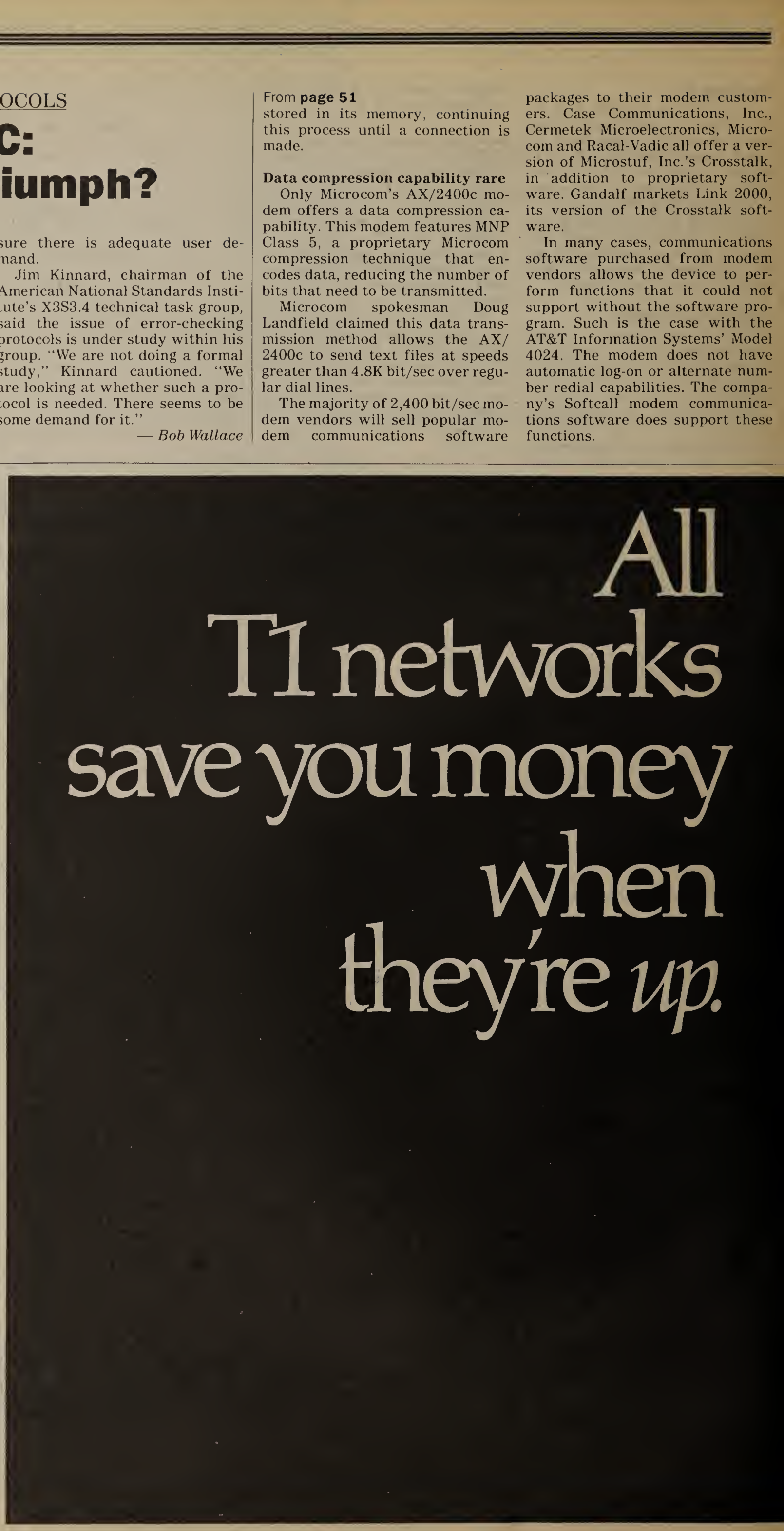
Data compression capability rare

Only Microcom's AX/2400c modem offers a data compression capability. This modem features MNP Class 5, a proprietary Microcom compression technique that encodes data, reducing the number of bits that need to be transmitted.

Microcom spokesman Doug Landfield claimed this data transmission method allows the AX/2400c to send text files at speeds greater than 4.8K bit/sec over regular dial lines.

The majority of 2,400 bit/sec modem vendors will sell popular modem communications software packages to their modem customers. Case Communications, Inc., Cermetek Microelectronics, Microcom and Racal-Vadic all offer a version of Microstuf, Inc.'s Crosstalk, in addition to proprietary software. Gandalf markets Link 2000, its version of the Crosstalk software.

In many cases, communications software purchased from modem vendors allows the device to perform functions that it could not support without the software program. Such is the case with the AT&T Information Systems' Model 4024. The modem does not have automatic log-on or alternate number redial capabilities. The company's Softcall modem communications software does support these functions.



Apple from **page 1**

cooperative programs. "There's another important business need that we have begun to meet [with the introduction of the Macintosh Plus]. And that's the need for the Macintosh Plus to connect into the worlds of IBM, IBM-compatibles and [Digital Equipment Corp.] machines," he said.

Sculley said the company's connectivity goals include not only micro-to-mainframe connections, but connectivity to peripherals and systems from other manufacturers.

Apple's IBM Personal Computer-compatible systems will not run MS-DOS, but will communicate with foreign operating systems through standard networking protocols for data exchange, according to Mike Homer, Apple's strategic sales technical manager.

"Apple also reached a strategic operating agreement with Northern Telecom, enabling Macintosh computers to be networked over standard twisted-pair telephone lines for simultaneous voice/data transmission."

"Apple will take it to the point of running object code across our system," Homer said. He said Apple is investigating such connections as coaxial, twinaxial, token-ring, protocol implementation and even Systems Network Architecture, Document Interchange Architecture and Document Content Architecture.

"The key to communications is open, expandable systems, and that's something we're going to do," Homer said.

Apple is not, however, abandoning Appletalk, the low-end network it introduced for the Macintosh last year. The company estimates that Appletalk networks comprise most of the 40,000 or so Macintoshes that are linked today by some 6,400 servers, many of them third-party products.

Appletalk has sold well in its niche of serving small work groups, and the company will continue to develop and support it, "but it will not be our only communications solution," Homer said.

Enhancements upcoming for Appletalk include support for more CPUs, including the Apple II, IBM Personal Computers and new, unnamed Apple CPUs, Homer said.

Apple also recently reached a strategic operating agreement with Northern Telecom, enabling Macintosh computers to be networked over standard twisted-pair telephone lines for simultaneous voice and data transmission using Northern Telecom digital PBX switches.

The link can be made with either Northern Telecom's new Meridian line, through the RS-422 port with an asynchronous interface line card or with earlier data modules through the RS-232-C port.

The hardware attachment allowing Macintosh to link up with Lanstar and access 3270 protocol conversion and System/36 and X.25 gateways costs $310 per connection for Meridian products, according to Northern Telecom.

The asynchronous interface line card providing access to RS-232 costs $300 for each Macintosh. Each telephone connection is available for $10.

Early ally reaps advantage

An earlier ally, 3Com, was able to take advantage of the Macintosh's new connectability with communications enhancements. Last September, Apple paired with 3Com to release Ethermac 3Server, through which the MS-DOS and Macintosh environments can share data among as many as 30 systems. That was recently supplemented by the announcement of 3Com's Diskplus, a high-performance, high-capacity disk drive.

Because of its plan to develop Macintosh support for the token-ring architecture chosen by IBM for its standard local-area network, 3Com may be the key to providing Macintosh's strongest link to the IBM world. 3Com hopes to release Macintosh token-ring support within the year.

The last six months have seen Apple develop a strategic alliance with General Electric Information Services Co. (Geisco). Geisco is marketing Businesstalk, an on-line service including data bases and electronic mail, over the Geisco national network with Macintosh computers as the interface. Apple started by building the system for its own use and for a still-growing Dealertalk network, linking its dealers across the country. Geisco and Apple are now jointly marketing the package to other companies.

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FEB. 10-11, WASHINGTON, D.C. — Personal Computer Local-Area Networks vs. Multiuser Systems, Departmental Dilemma. Contact: Architecture Technology Corp., P.O. Box 24344, Minneapolis, Minn. 55425.

FEB. 13-14, WASHINGTON, D.C. — Bypassing the Local Telephone Exchange: Season for Dynamic Change. Contact: Philips Publishing, Inc., 7811 Montrose Road, Potomac, Md. 20854.

FEB. 18, DENVER — Local-Area Networks. Also, Feb. 20, Austin, Texas; March 4, New York; March 6, Boston. Contact: Bridge Communications, Inc., 2081 Stierlin Road, Mountain View, Calif. 94043.

FEB. 26-27, LOS ANGELES — Educational Seminar on T-1 Facilities and Networking. Also, March 19-20, Scottsdale, Ariz. Contact: Mike O'Hara, Timeplex, Inc., 400 Chestnut Ridge Road, Woodcliff Lake, N.J. 07675.

FEB. 27-28, SAN DIEGO — Fiber Optics for the Nontechnical Manager. Contact: Philips Publishing, Inc., 7811 Montrose Road, Potomac, Md. 20854.

MARCH 5-7, PORTLAND, Ore. — Data Communications. Also, March 12-14, Baltimore; March 19-21, New Orleans; March 24-26, Raleigh, N.C.; April 2-4, Los Angeles; April 9-11, Boston; April 16-18, Palo Alto, Calif.; April 21-23, Cincinnati. Contact: Center for Advanced Professional Education, Suite 110, 1820 E. Garry St., Santa Ana, Calif. 92705.

MARCH 10-14, WASHINGTON, D.C. — Open Systems Interconnect. Contact: Omnicom, Inc., Suite 304, 501 Church St. N.E., Vienna, Va. 22180.

MARCH 11-12, HOUSTON — dBase III: Programming Business Applications. Also, March 13-14, Denver. Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

MARCH 12-14, SAN FRANCISCO — Connecting the IBM Personal Computer and Other Personal Computers to: Mainframes, Networks, On-Line Data Bases, PBXs, Local-Area Networks and other Personal Computers. Also, March 19-21, Boston. Contact: Data-Tech Institute, Lakeview Plaza, P.O. Box 2429, Clifton, N.J. 07015.

MARCH 12-14, DALLAS — Integrated Services Digital Network/ Broadband Networks for the Future '86. Contact: Information Gatekeepers, Inc., 214 Harvard Ave., Boston, Mass. 02134.

MARCH 17, BOSTON — Corporate Integrated Services Digital Network Strategies. Also, March 19, Washington, D.C.; March 21, New York. Contact: IGI Consulting, Inc., Suite 200, 214 Harvard Ave., Boston, Mass. 02134.

MARCH 17-18, SAN FRANCISCO — Networking Personal Computers. Contact: Deltel, New York University Seminar Center, 575 Madison Ave., New York, N.Y. 10022.

MARCH 17-21, SAN DIEGO — Fiber and Integrated Optics. Contact: J.W. Perkins, George Washington University, Washington, D.C. 20052.

MARCH 21, SUNRISE, Fla. — Integrated Services Digital Network. Contact: Dorrell Shirley, Racal-Milgo, Inc., 1601 N. Harrison Pkwy., Sunrise, Fla. 33323.

APRIL 2-3, WASHINGTON D.C. — Leadership '86. Contact: Jessie Newburn, The Alliance, P.O. Box 33984, Washington, D.C. 20033.

APRIL 2-4, WASHINGTON, D.C. — Video Teleconferencing. Contact: Chip Blouin, George Washington University, Washington, D.C. 20052.

APRIL 2-4, WASHINGTON, D.C. — Installing, Operating and Troubleshooting Data Communications Equipment. Contact: Chip Blouin, George Washington University, Washington, D.C. 20052.

APRIL 7-10, WASHINGTON, D.C. — Modern Data Communications. Contact: Shirley Forlenzo, George Washington University, Washington, D.C. 20052.

MAY 19-21, WASHINGTON, D.C. — Integrated Services Digital Networks. Contact: Shirley Forlenzo, Continuing Engineering, 801 22nd St. N.W., Room T309, Washington, D.C. 20052.

MAY 19-23, SAN DIEGO — Modern Communications and Signal Processing. Contact: Shirley Forlenzo, Continuing Engineering, 801 22nd St. N.W., Room T309, Washington, D.C. 20052.

MAY 28-30, WASHINGTON, D.C. — Fundamentals of Data Communications. Contact: Shirley Forlenzo, Continuing Engineering, 801 22nd St. N.W., Room T309, Washington, D.C. 20052.

JUNE 16-18, NEW YORK — Intelligent Buildings: The Business Strategy Conference and Exposition. Contact: Online International, Inc., 989 Avenue of the Americas, New York, N.Y. 10018.

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